SAN FRANCISCO CLEAN WATER PROGRAM
CITY AND COUNTY OF SAN FRANCISCO

BAYSIDE FACILITIES PLAN

SOUTHEAST BAYSIDE PROJECT REPORT

MARCH 1982

CGKT CALDWELL-GONZALEZ-KENNEDY-TUDOR
CONSULTING ENGINEERS

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March 31, 1982

Mr. Harold C. Coffee, Jr.
Project Manager, Bayside Facilities
San Francisco Clean Water Program
150 Hayes Street, Sixth Floor
San Francisco, California 94102

500-80/9

Subject: Bayside Facilities Plan Background Report

Dear Mr. Coffee:

This report contains information common to all the Bayside Facilities Plan project reports and includes descriptions of overall service area characteristics, water and wastewater characteristics, analysis of existing bay side wastewater facilities, and waste discharge and treatment requirements.

The Bayside Facilities Planning Project is documented in a series of reports. The major reports include the (1) Background Report, (2) Crosstown Project Report, (3) Southeast Bayside Project Report, and (4) North Bayside Project Report. Collectively, the three project reports contain an analysis of alternatives and the description of the apparent best alternative for the Bayside Facilities.

Very truly yours,

Robert L. Mills

Robert L. Mills
General Manager

RLM:ch
Enclosure

1501 NORTH BROADWAY, WALNUT CREEK, CALIFORNIA 94596 (415) 937-9010
A JOINT VENTURE OF
BROWN AND CALDWELL - GEOTECHNICAL CONSULTANTS, INC. - KENNEDY ENGINEERS, INC. - TUDOR ENGINEERING COMPANY

PREFACE

The Bayside Facilities Planning Project is documented in a series of reports. The essence of the project is contained in four reports: (1) Background Report, (2) Crosstown Project Report, (3) Southeast Bayside Project Report, and (4) North Bayside Project Report. The Background Report contains information common to all project reports and descriptions of overall service area characteristics, water and wastewater characteristics, analysis of existing bay side wastewater facilities, and waste discharge and treatment requirements. The Crosstown Project Report contains the analysis of alternatives and the description of the apparent best alternative for three of the eight major Bayside Facilities elements: (1) Crosstown Transport Facility, (2) Crosstown Pump Station, and (3) Islais-Creek Transport/Storage Facility. The Southeast Bayside Project Report contains the analysis of alternatives and the description of the apparent best alternative for two of the Bayside Facilities elements: (1) Sunnydale-Yosemite Transport/Storage Facility, and (2) Hunters Point Transport/Storage Facility. The North Bayside Project Report contains the analysis of alternatives and the description of the apparent best alternative for three of the Bayside Facilities elements: (1) Channel-Islais Creek Transport Facility, (2) Mariposa Transport/Storage Facility, and (3) North Shore Transport Facility. Figures for the Crosstown, Southeast Bayside, and North Bayside project reports are bound in separate volumes from the volumes containing text and tables.

Other reports in the series are the Interim Report, the Final Geotechnical Report, the Traffic Impacts Analysis Report, the Citywide Control System Report, the Operational Plan Report, the Spoils Disposal Report, the Solids Handling Report, and the report on the Odor Control Program.

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CHAPTER 1

INTRODUCTION

This report presents the analysis of final alternatives, a comparison of the final alternatives, a detailed description of the recommended apparent best alternative, and summary and recommendations for the Southeast Bayside Project. The Southeast Bayside Project consists of two of the eight major wet weather elements developed in the Bayside Facilities Planning Project, viz., the Sunnydale-Yosemite Transport/Storage Facility and the Hunters Point Transport/Storage Facility. The other elements are the Crosstown Transport Facility, the Crosstown Pump Station, and the Islais Creek Transport/Storage Facility, which collectively constitute the Crosstown Project (Reference 1); and the North Shore Transport Facility, the Channel-Islais Transport Facility, and the Mariposa Transport/Storage Facility, which collectively constitute the North Bayside Project (Reference 2).

The locations of the major elements comprising the Bayside Facilities Planning Project are shown on Figure 1-1.

BASIS OF PLANNING

The culmination of citywide planning for the overall wastewater management system is embodied in the Southwest Facilities Plan, which consists of the Southwest Water Pollution Control Plant Project, Final Project Report (Reference 3), dated February 1980, and the Final Environmental Impact Report, Southwest Water Pollution Control Plant (Reference 4), certified August 23, 1979. The San Francisco Board of Supervisors adopted Resolution No. 120-80 approving the Southwest Facilities Plan on February 7, 1980, and the State Water Resources Control Board (SWRCB) granted concept approval on May 7, 1980.

The Southwest Facilities Plan examined treatment process capabilities for both dry and wet weather flows, the cost-effective management of wet weather flows, and the preliminary sizing and siting of facilities for the entire City. Alternatives were developed and assessed on the basis of economics, treatment capabilities, environmental and engineering factors, and planning goals. The most cost-effective alternative, Master Plan 1B, was recommended and adopted as the Clean Water Program Master Plan.

The scope of work for the Bayside Facilities Planning Project was based on the conclusions of the Southwest Facilities Plan.

CLEAN WATER PROGRAM MASTER PLAN

Basically, Master Plan 1B will greatly reduce the frequency and amount of combined sewer overflows to the shoreline, improve the level of treatment of dry and wet weather flows, and dispose of all treated flows to the Pacific Ocean. Master Plan 1B includes the interception and conveyance of most of the wet weather flows from the bay side of the City to wet weather treatment facilities at the Southwest Water Pollution Control Plant (WPCP) for treatment prior to disposal through the Southwest Ocean Outfall more than 2 miles offshore in the Pacific Ocean. The two dry weather treatment plants (Southeast WPCP serving the bay side of the City and Southwest WPCP serving the west side of the City) would operate at their maximum treatment capacities during storms to reduce demands on the wet weather plant and to provide the highest level of available treatment for wastewater flows. Effluent from the dry weather treatment plants would be combined and discharged separately from the wet weather treatment plant effluent more than 4 miles offshore in the Pacific Ocean.

In late 1979, public concern increased over the cost of the wastewater program and the uncertainty of federal and state grant funding. As a result, the City engaged an independent consulting firm to make an overview study. Their report (Reference 5) recommended that additional wet weather treatment capacity could be achieved at the Southeast WPCP by splitting the primary and secondary treatment processes (Split-Flow), thereby increasing the overall treatment capacity of the plant. The plan would reduce the required capacity of the Southwest WPCP wet weather facilities, thereby reducing costs.

The Clean Water Program concurred that provision of additional wet weather treatment capacity on the bay side could reduce capital costs and alleviate short-term funding limitations. The additional capacity could be obtained by modification of operations at the Southeast WPCP, retention of the North Point WPCP for treatment of wet weather flow only, or construction of other wet weather treatment facilities. Also, a reevaluation of the Southwest Ocean Outfall indicated that it would be most cost-effective to discharge both treated dry and wet weather flows through a single pipe to a location more than 4 miles offshore.

To ensure operable facilities in the event of funding curtailments, the Clean Water Program adopted a carefully structured staged implementation program. Stage I consists of the Master Plan facilities already constructed or under construction.

Stage II consists of all facilities required to treat and dispose of all dry weather flows and most wet weather flows to the ocean. During Stage II, the North Point WPCP will be retained to treat up to 140 mgd of wet weather flow only for discharge to the bay; all other treated wet weather flows will be transported through the Crosstown Transport for discharge to the ocean. Stage II facilities will also include those required to implement split flow treatment at the Southeast WPCP or provide other wet weather treatment capacity on the bay side. Stage II consists of those additional facilities required to discharge all dry and treated wet weather flows to the ocean. Therefore, Stage III includes elimination of the 140 mgd wet weather discharge from the North Point WPCP. Stage III conforms with the basic objective of Master Plan 1B. During dry weather, Stage II and III operations will be identical, and all dry weather flow will receive secondary treatment before discharge to the ocean.

Major elements of the bay side system that have been initiated or completed include (1) expansion of the Southeast WPCP to provide secondary treatment for all dry weather flows from the bay side of the City, (2) construction of the North Shore Pump Station and Force Main for transport of dry weather flows from the North Shore to the Channel areas, (3) construction of the North Shore Outfalls Consolidation facility for the transport of dry weather flows and the transport/storage of wet weather flows consolidated in the North Shore area to the North Shore Pump Station, (4) construction of the Channel Outfalls Consolidation facility for the transport of dry weather flows and the transport/storage of wet weather flows consolidated in the Channel area to the Channel Pump Station, and (5) construction of the Channel Pump Station and Force Main for the transport of dry weather flows from the Channel area to the Southeast WPCP. The general locations and interconnections of these bay side wastewater management facilities are shown on Figure 1-1.

WATER QUALITY OBJECTIVES

At present, there are 31 combined sewer overflow points along the bayshore between Baker Street and Sunnydale Avenue as shown on Figure 1-1. When completed, the Bayside Facilities will greatly reduce the frequency of overflows and provide protection for the many beneficial uses of San Francisco Bay. In addition, some of the combined sewer outfalls may be relocated or eliminated to provide greater protection of receiving water quality. The level of combined sewer overflow control necessary for protection of receiving water quality has been specified by the California Regional Water Quality Control Board, San Francisco Bay Region (RWQCB), in National Pollutant Discharge Elimination System (NPDES) Permit No. CA0038610, dated June 19, 1979. This permit has been reproduced in Appendix C of this report. These levels are four overflows per year on the average for the North Shore area (Outfalls 9 through 17), ten per year for the central area from the Ferry Building to Islais Creek (Outfalls 18 through 35), and one per year for the area south of Islais Creek (Outfalls 37 through 43).

FUNCTION OF FACILITIES

The function of the facilities comprising the Southeast Bayside Project is to reduce combined sewer overflows for the area south of Islais Creek (Outfalls 37 through 43) to no more than an average of one per year through a combination of storage of wet weather flow peaks and conveyance of wet weather flow to the Islais Creek Transport/Storage Facility. Stages II and III of the Clean Water Program were discussed above under the Clean Water Program Master Plan. All of the Southeast Bayside Project facilities will be constructed in Stage II, and no additional facilities will be required in Stage III.

Subsequent to the completion of Chapters 3 and 4 of this report, the original treatment and flow configurations for the Crosstown Project were modified to incorporate the Store-Treat process into the Islais Creek Transport/Storage Facility. Originally the Split-Flow process was envisioned, as discussed above under the Clean Water Program Master Plan. The Store-Treat concept and the resultant selection of facilities in the Islais Creek area are described in the Crosstown Project Report (Reference 1).

The conveyance of wet weather flows from the Southeast Bayside Project facilities into the Islais Creek Transport/Storage Facility will be the same regardless of whether Split-Flow or Store-Treat is finally implemented. For this reason the ramifications of these two treatment concepts are not covered in this report. Please refer to the Crosstown Project Report for a more complete explanation and discussion.

CONSTRUCTION STAGES

The Sunnydale-Yosemite Transport/Storage Facility and the Hunters Point Transport/Storage Facility are the same for both Master Plan Stage II and Stage III operations and will be built as Stage II projects.

The overall Clean Water Program schedule and the specific implementation schedule for the two Southeast Bayside Project facilities are currently being negotiated with the SWRCB and will ultimately depend on the availability of federal and state grant funds. To perform the required present worth analysis, however, use was made of the Clean Water Program Master Plan Summary Schedule, dated June 10, 1980, as revised on October 16, 1980, which was in effect when the present worth analysis was performed.

Proposed construction periods for the two Southeast Bayside Project facilities, according to that tentative schedule, are shown in Table 1-1.

COST ESTIMATING PROCEDURE

According to U.S. Environmental Protection Agency (USEPA) guidelines, contained in Appendix A of 40 CFR 35, printed in the Federal Register, Volume 43, No. 188, dated September 27, 1978, and reproduced in Appendix D of this report, total present worth or equivalent annual costs must be used in the cost-effectiveness analysis to determine which alternative facility will result in the minimum total cost over time to meet federal, state, or local requirements. Inflation, except for land and natural gas, cannot be considered in the cost-effectiveness analysis.

Federal guidelines require that costs be estimated on the basis of prices prevailing at the time at which the cost-effectiveness analysis was begun, which was January 1980 for this study. Also, the guidelines require that the cost-effectiveness analysis be based on a 20-year planning period commencing from the initial operation of the system. For the Bayside Facilities Planning Project, the planning period will begin when all Stage III Bayside Facilities become operational on January 1, 1990, according to Master Plan Summary Schedule as revised on October 16, 1980. Although some facilities will be operational before this date, for consistency of cost analyses, it is assumed that the planning period for the earlier completed facilities will also begin on January 1, 1990.

The useful life of all Bayside Facilities will be 50 years except for pumps and other mechanical and electrical equipment. Pumps and mechanical and electrical equipment will have useful lives of 20 years. Depreciation will be calculated by the straight-line basis with no salvage value at the end of the useful life. The value of land will appreciate rather than depreciate. Sunk costs, such as existing facilities, outstanding indebtedness, or this planning study are not considered.

In preparing the present worth or equivalent annual cost estimates, consideration of the time value of money is made by using a discount factor established annually be the U.S. Water Resources Council. The discount rate of 7-1/8 percent per annum, applicable to this study, was published in the Federal Register (page 62116) on October 29, 1979.

Table 1-1 Construction Schedule for Southeast Bayside Project Facilities

Facility	Start of construction	End of construction
Sunnydale-Yosemite transport/ storage facility	June 1, 1983	June 1, 1986
Hunters Point transport/storage facility	January 1, 1984	July 1, 1985

Notes: Based on Clean Water Program Master Plan Summary Schedule, dated June 10, 1980, as revised October 16, 1980.

All facilities will be constructed during Stage II.

An example of a total present worth analysis is presented in Appendix E.

Escalated project costs, which are the actual costs of implementing and operating the facility, including the increased costs due to inflation in construction and related services, are not presented in this report because federal and state funding uncertainties make development of firm implementation schedules unrealistic. These costs recognize when facilities are scheduled for construction and when services are required in the future by inflating costs to those times.

Contract cost estimates, which are estimates of a contractor's bid price, were prepared for each alternative based on historical construction costs for similar facilities and updated by use of the Engineering News-Record (ENR) Construction Costs Index, which is computed from actual prices of construction materials and labor. The Construction Cost Index for San Francisco in January 1980, the base date for the cost-effectiveness analysis, was approximately 3800.

Construction contingencies are to cover extra costs that are unforeseen at the time the estimate is prepared. There are two sources of these costs. First, the low contract bid may be higher than the cost estimate. Second, some contract change orders will inevitably occur during the construction period. Change orders are usually caused by one or more problems such as unanticipated subsurface conditions, interference with utilities, and time delays. The amount of unknowns generally decrease as planning and design progresses from the conceptual stage to final design; therefore, the amount of the construction contingencies is correspondingly decreased. For this project, the contingency has been estimated at 10 percent during the analysis of final alternatives.

Professional services include design engineering, office engineering during construction, construction inspection, administration, legal work, affirmative action, public information, and start-up and training programs. Professional services historically have approximated the following percentages of construction cost, excluding contingencies:

Engineering	
Design	6 percent
Office engineering during construction	1 percent
Construction inspection	5 percent
Soils, surveys, and materials testing	1 percent
Legal work administration, affirmative action, and public participation	2 percent
Start-up and training	1 percent
Total	16 percent

Capital cost is the sum of contract cost, construction contingency cost, professional services cost, land cost, and the cost of interest during construction (using a discount rate of 7-1/8 percent per annum).

Operation and maintenance costs are separated into three categories: (1) labor, (2) equipment and materials; and (3) energy. The background report for the Bayside Facilities Plan (Reference 6) determined that there are no projected increases in wastewater flows throughout the planning period for the Bayside Facilities. Therefore, operation and maintenance costs are all fixed with respect to flow. Cost estimates for labor, equipment, and materials were based on City records and historical experience from other similar wastewater facilities. Cost estimates for energy consumption were calculated for the specific installations under evaluation.

CONDUCT OF STUDY

The organization of the project team is presented on Figure 1-2. Each of the four engineering consulting firms that make up the Joint Venture was assigned responsibility for a major engineering element. Brown and Caldwell was responsible for the transport/storage facilities and the instrumentation and control system; Geotechnical Consultants, Inc., was responsible for the geotechnical engineering aspects of all facilities; Kennedy/Jenks Engineers was responsible for pump stations and force mains; and Tudor Engineering Company was responsible for the tunnels. In addition, several important supporting activities were identified which were assigned to one of the Joint Venture member firms or to a subconsultant.

Under the general direction of the Clean Water Program, the Bayside Facilities Planning Project was managed by Dr. Donald L. Feuerstein, general manager of Caldwell-Gonzalez-Kennedy-Tudor. Project managers from each of the Joint Venture member firms were: Roger F. Wilcox, Brown and Caldwell; Joseph M. Gonzalez, Geotechnical Consultants, Inc.; Robert M. Purdie and E. J. Mahood, Kennedy/Jenks Engineers; and Donald C. Rose and Paul E. Potter, Tudor Engineering Company.

AUTHORIZATION

The Bayside Facilities Planning Project was performed under authority of Section 201 of Public Law 92-500, as amended by Public Law 95-217, and applicable SWRCB regulations and guidelines.

Authorization for Caldwell-Gonzalez-Kennedy-Tudor, a Joint Venture, to perform the Bayside Facilities Planning Project was given on September 14, 1979, by the City and County of San Francisco. The project is being partially funded under USEPA Grant No. C-06-1399-010.

CHAPTER 2

SUMMARY AND RECOMMENDATIONS

The Southeast Bayside Project consists of the Sunnydale-Yosemite and the Hunters Point Transport/Storage Facilities. These two elements of the Bayside Facilities Planning Project are located in the southeast quadrant of the city south of Islais Creek, where the level of control for combined sewer overflows has been set at only one overflow per year. This level is specified by the California Regional Water Quality Control Board (RWQCB), San Francisco Bay Region, in National Pollutant Discharge Elimination System (NPDES) Permit No. CA 0038610, dated June 19, 1979, and is considered necessary to protect the receiving water quality in San Francisco Bay along the shore from India Basin south to San Mateo County (see Appendix C). Presently there are seven combined sewer overflow points along this stretch of shoreline; three are in India Basin, three are in South Basin, and one is near San Francisco's southerly city limit. (Refer to Figure 1-1 for the locations of these outfalls, numbered 37 through 43 inclusive.) Ensuring the high level of protection specified requires a combination of storage of wet weather flow peaks and conveyance of wet weather flows to the Islais Creek area for storage, treatment, or disposal. This combination of conveyance and storage has been termed transport/storage throughout the planning process.

A number of alternatives were identified early in the study which satisfy the transport/storage concept. These range from high rates of pumping and conveyance out of the drainage basins, with correspondingly low storage requirements, to large storage reservoirs within the basins, with low withdrawal rates. Transport modes range from tunnel or large gravity conduits to shallow pressure pipelines (force mains). Storage options range from reservoirs located in sites off-line from conveyance elements, to in-line storage under public streets or rights-of-way. A variety of routes was studied for transporting wet weather flows to the Islais Creek Transport/Storage Facility, and different sites were identified for locating pump stations or reservoirs.

ANALYSIS OF ALTERNATIVES

Twenty-five different alternatives were originally identified for the Sunnydale-Yosemite and Hunters Point Transport/Storage Facilities. Twenty-one of these were for Sunnydale-Yosemite wet weather flows, while four alternatives were studied for Hunters Point. The initial alternatives were reduced to six final alternatives for Sunnydale-Yosemite, while the four alternatives studied for Hunters Point were retained because of their limited number, and a fifth alternative was added during final analysis. The initial alternatives were reduced by a screening process that evaluated both monetary and nonmonetary costs. This portion of the planning effort is documented in the Bayside Facilities Plan, Interim Report (Reference 6). The eleven final alternatives are described in detail and analyzed in Chapter 3 below in accordance with state guidelines for planning wastewater facilities.

Sunnydale-Yosemite Transport/Storage Facility

Existing and required facilities are described for the Sunnydale and Yosemite drainage basins. The two basins can be combined or sewered separately. Transport can be provided through tunnels, pump stations and force mains, gravity sewers, or combinations of the three. Storage can be provided in offstreet reservoirs or in oversized transport facilities located under City streets. Each one of the six final alternatives represents a singular arrangement of a combination of pump station and reservoir sites, and transport and storage elements. Each alternative satisfies the planning criteria developed for the facility plan.

Alternative 1C-1. In this alternative the Sunnydale and Yosemite drainage basins are separated during periods of wet weather flows. Each basin requires a pump station and a covered reservoir. The Sunnydale wet weather flow is pumped north through a new force main to the existing Selby Street trunk sewer near Highway 101. The Yosemite wet weather flow is pumped north through the existing Hunters Point tunnel to the Islais Creek South Side Outfalls Consolidation (ICSSOC). Overflows from the Sunnydale basin would occur from the existing overflow point near the county line, after passing through the Sunnydale Reservoir. Overflows from the Yosemite basin would occur from the Yosemite Reservoir into the South Basin Canal. The three existing overflows would be intercepted and consolidated by routing all flows to the covered reservoir.

Alternative 2A. In this alternative the Sunnydale wet weather flow would be stored in a covered reservoir and transported by gravity, at a controlled rate, through existing and new transport elements via the existing Candlestick tunnel to the Yosemite Reservoir. Wet weather flows from both drainage basins would then be pumped by a large pumping station located south of the South Basin Canal to the ICSSOC via the existing Hunters Point tunnel. Overflows from the Sunnydale basin would occur from the existing outfall near the San Mateo County line, while overflows from the Yosemite basin would be consolidated and occur from the Yosemite Reservoir into the South Basin Canal.

Alternative 2A-1. This alternative is similar to Alternative 2A except that a greater amount of storage is provided in transport/storage structures in streets in the Yosemite area. This results in a smaller covered reservoir being required near the Yosemite Pump Station. The pump station/reservoir site is located north of the South Basin Canal. If required, an overflow would be constructed from the reservoir to a new discharge location outside the canal (see Figure 3-12). The new overflow would be constructed only if experience proves that the existing overflows at Fitch and Griffith Streets and Yosemite Avenue are inadequate. The Sunnydale Outfall is the same as in previous alternatives.

Alternative 2A-2. In this alternative the Sunnydale facilities are identical to those described for Alternatives 2A and 2A-1. Wet weather flow in the Yosemite basin and the wet weather flow imported from the Sunnydale basin would be stored entirely in transport/storage structures under streets in public rights-of-way in the Yosemite area. A new pumping station north of the South Basin Canal would pump combined wet weather flows north to the ICSSOC via the Hunters Point tunnel. The three existing outfall locations would be retained for overflows into the South Basin Canal through new control structures.

Alternative 3B. In this alternative there would be no pumping station or reservoir in the Sunnydale basin. Wet weather flow would be transported to the Yosemite basin through a combination of the existing Candlestick tunnel and a new large gravity transport sewer around Candlestick Park. Wet weather flows from both drainage basins would be routed by gravity through a new tunnel from the Yosemite basin to Islais Creek. Storage in the Yosemite area would be under streets as in Alternative 2A-2. Overflows would be as in Alternative 2A-2.

Alternative 3B-1. In this alternative there would be a covered reservoir in the Sunnydale basin, which eliminates the need for the new large gravity transport sewer required under Alternative 3B. The remainder of the alternative is similar to Alternative 3B, that is, it features a new tunnel from the Yosemite basin to Islais Creek and storage under streets in the Yosemite area.

The six final alternatives described above are sized to store and transport combined sewer storm flows out of the Sunnydale-Yosemite basins and into the Islais Creek Transport/Storage Facility such that no more than one overflow per year occurs on the long-term average in the Sunnydale/Yosemite basins. In addition, the facilities are sized to convey the 5-year storm flow rate into the bay through the outfall structures. Facilities are arranged so that all overflows to the bay occur from a storage structure. The City must improve some portions of the existing upstream sewer system before the 5-year storm flow can reach the Sunnydale and Yosemite facilities.

Hunters Point Transport/Storage Facility

Existing and required facilities are described for the Hunters Point drainage basin. At present the dry weather flow from this basin joins the flow from the Yosemite basin near the north portal of the Hunters Point tunnel, from which point all the flow is transported to the Southeast WPCP for treatment. The existing Hunters Point sewer system cannot convey the amount of wet weather flow necessary to meet overflow requirements of the NPDES permit. As described above for Sunnydale-Yosemite, there are many potential alternatives for providing the required wet weather storage and transport capacities. Four final alternatives were chosen that feature different arrangements of pump stations, reservoirs, force mains, tunnels, or storage structures. These four alternatives were developed and screened in the initial planning effort described in the Bayside Facilities Plan, Interim Report (Reference 6). A fifth alternative was identified subsequent to the initial screening and subjected to detailed analysis in Chapter 3. Some of the alternatives will require certain modifications to the existing Evans Avenue Interceptor. These modifications are also detailed in Chapter 3.

Alternative 16A-1. In this alternative an underground reservoir is required in the vicinity of the Hudson Street and Griffith Street North outfalls. A new wet weather pump is required in the existing Hunters Point Pump Station. A 36-inch-diameter gravity sewer is provided for the transport element. Overflows from the Hunters Point drainage basin would occur from two of the three existing outfall points in India Basin. The Griffith Street North Outfall would be plugged and abandoned. Overflow connections would allow an overflow only when the reservoir is full.

Alternative 16B-1. This alternative is similar to Alternative 16A-1 except that storage would be provided by in-street transport/storage structures instead of in a reservoir. Overflows are treated the same as in Alternative 16A-1.

Alternative 16C-1. In this alternative gravity sewers are required to transport wet weather flows to the modified Evans Avenue Interceptor. No storage structures are required. Outfall connections are similar to Alternatives 16A-1 and 16B-1, except that overflows would occur when the maximum withdrawal rate is exceeded.

Alternative 16D-1. In this alternative a tunnel connection is required from the vicinity of the existing Hunters Point Pump Station to the existing Hunters Point tunnel to transport flow to the Islais Creek area. The existing pump station would be abandoned. Overflows would occur from the existing outfalls when the 1-year flows are exceeded.

Alternative 16E-1. In this alternative existing outfall structures are modified, a covered reservoir is provided, the existing Hunters Point Pump Station is expanded, and new gravity sewers and a force main are required. The concept of this alternative is to maximize the wet weather transport rate in order to minimize the required volume of storage. The overflow connections would be similar to Alternative 16A-1, wherein the Griffith Street North Outfall would be plugged, and overflow would only occur when the reservoir is full.

The five final alternatives described above are sized hydraulically to store and transport combined sewer storm flows out of the Hunters Point basin into the Islais Creek Transport/Storage Facility such that no more than one overflow per year occurs on the long term average in the Hunters Point basin. Comments on handling the 5-year storm event are the same as given above for the Sunnydale-Yosemite facilities.

SUMMARY COMPARISON OF ALTERNATIVES

After the final alternatives are analyzed in Chapter 3, a comparison is made in Chapter 4 of cost, environmental, and socioeconomic factors. This comparison results in a recommendation of the apparent best alternative for the Sunnydale-Yosemite and Hunters Point Transport/Storage Facilities.

Evaluation Procedure

The evaluation procedure used to compare the final alternatives consists of ranking each alternative against the set of evaluation factors developed in Chapter 4 of this report. These factors include cost, energy consumption, land requirements, traffic impacts, flexibility, reliability, implementability, and public acceptability. The importance of each factor was considered, and a comparison was made of a series of trade-offs between the advantages and disadvantages of each alternative against other alternatives.

A no project alternative was also considered, as required by state guidelines for planning wastewater facilities. This alternative was rejected primarily because it would result in a violation of the NPDES permit requirement calling for a reduction of overflows to one per year.

Sunnydale-Yosemite Transport/Storage Facility

The evaluation procedure detailed in Chapter 4 resulted in Alternative 2A-1 being designated as the apparent best alternative, primarily because of its high ranking on socioeconomic factors. It also ranked number two in cost, being only 4 percent higher than the least expensive alternative, Alternative 2A. Alternative 2A-1 is significantly more acceptable to the public than Alternative 2A, however, because the Yosemite Reservoir and pump station site are located on City property and away from the housing project impacted by Alternative 2A. Alternative 2A-1 is also the easiest alternative to implement.

Hunters Point Transport/Storage Facility

Alternative 16C-1 is the apparent best alternative, having the lowest present worth cost and ranking best under land requirements, traffic impacts, flexibility, and public acceptability. It also ranks well under energy consumption, reliability, and implementability.

RECOMMENDED APPARENT BEST ALTERNATIVES

The apparent best alternative Southeast Bayside Project consists of a storage reservoir and transport structures and conduits in the Sunnydale area; large transport structures and conduits, a reservoir, and a pump station in the Yosemite area; large transport sewers downstream of the existing Hunters Point tunnel; and a system of transport sewers in the Hunters Point area. The apparent best alternative for each element is described in detail in Chapter 5.

Sunnydale-Yosemite Transport/Storage Facility

The apparent best alternative for the Sunnydale-Yosemite Transport/Storage Facility is Alternative 2A-1. The features of this alternative are shown on Figures 5-1 through 5-3, inclusive.

Details of the Apparent Best Alternative. Pumping rates and facility sizes are based on initiating maximum withdrawal from Islais Creek storage within 1 hour from the commencement of a storm. In order to accomplish this requirement and limit overflows from the Sunnydale and Yosemite basins to one per year, the following facilities are included in Alternative 2A-1:

1. A 10-million-gallon covered reservoir and dewatering pump station in the Sunnydale basin.

2. Box conduits and large circular sewers in the Sunnydale area.

3. Transport/storage structures in the Yosemite area.

4. A 7.5-million-gallon covered reservoir and a 120 million gallons per day (mgd) pumping station in the Yosemite basin.

5. Large circular transport sewers downstream of the Hunters Point tunnel connection to the Islais Creek South Side Outfalls Consolidation.

The total construction cost of these facilities is estimated at $68 million, based on an ENR of 3800. Refer to Table 5-5 for details of this cost estimate.

Dry weather flow in the Sunnydale area will bypass the Sunnydale Reservoir and follow its existing route through the Candlestick tunnel and into the priority level pump sump at the Yosemite basin. A new transport facility will convey the dry weather flow from the downstream end of the Candlestick tunnel to the new Yosemite Pump Station. Dry weather flow will be lifted by this pump station through a new force main to the existing Hunters Point tunnel to the Southeast WPCP. The major portion of the Yosemite basin dry weather flow will follow its present gravity route to the Hunters Point tunnel and the Southeast WPCP.

Recommendations. It is recommended that Alternative 2A-1 be selected as the Apparent Best Alternative Sunnydale-Yosemite Transport/Storage Facility, and that this facility be constructed as part of the Stage II Bayside Project.

Hunters Point Transport/Storage Facility

The apparent best alternative for the Hunters Point Transport/ Storage Facility is Alternative 16C-1. The features of this alternative are shown on Figures 5-18 and 5-19. Subsequent to the selection of this alternative in Chapter 4, the Inchon-Solomon subarea was added to the Hunters Point drainage basin, resulting in additional storm flow to the proposed facility and requiring a slightly larger gravity sewer transport system. Construction costs given in Chapter 5 were modified to reflect the additional cost.

Details of Apparent Best Alternative. Wet weather flow is conveyed by gravity sewers from the existing Griffith Street North Outfall to the existing diversion structure on the Hudson Avenue Outfall, and from here in a new gravity sewer in Hunters Point Boulevard to Evans Avenue. Several modifications are required to the existing Evans Avenue sewer so that the Hunters Point wet weather flow can be transported to the Islais Creek South Side Outfalls Consolidation Facility. The estimated construction cost of these facilities is $2.56 million, based on an ENR of 3800.

The existing dry weather system serving the Hunters Point drainage basin will be retained in the apparent best alternative.

Recommendations. It is recommended that Alternative 16C-1 be selected as the Apparent Best Alternative Hunters Point Transport/ Storage Facility, and that this facility be constructed as part of the Stage II Bayside Project.

CHAPTER 3

ANALYSIS OF ALTERNATIVES

Two major bay side construction elements constitute the Southeast Bayside Project. These are the Sunnydale-Yosemite Transport/Storage Facility and the Hunters Point Transport/Storage Facility. The general facility requirements and a detailed description and analysis of the final alternatives are presented in this chapter. A comparison of final alternatives and selection of the recommended apparent best alternatives are presented in Chapter 4. The development and screening of initial alternatives that resulted in the selection of final alternatives is documented in the Bayside Facilities Plan, Interim Report (Reference 7).

SUNNYDALE-YOSEMITE TRANSPORT/STORAGE FACILITY

The Sunnydale-Yosemite Transport/Storage Facility reduces combined sewer overflows through a combination of storage of wet weather flow peaks and conveyance of wet weather flow to the Islais Creek Transport/Storage Facility. The relationship between the flows from the Sunnydale-Yosemite Transport/Storage Facility and the flows from the other Bayside Facilities in Stages II and III is shown schematically on Figure 3-1. The present average number of overflows in the area south of the Ferry Building is 46 per year. Sufficient transport and storage capacity must be provided to reduce the overflows to an annual average of one per year in the area south of Islais Creek.

Existing Facilities

The existing sewer system for the Sunnydale and Yosemite basins transports combined wastewater north to the Southeast Water Pollution Control Plant (WPCP). Many of the major sewers have capacity for storm flows which occur with a frequency of once in 5 years. Connecting interceptors and pump stations, however, are sized only for peak dry weather flow plus storm flow from a 0.01-inch rainfall or average dry weather flow plus storm flow from a 0.02-inch rainfall, whichever is greater. When heavy storm flows occur, the system overflows through specially provided structures along the bay shoreline. There is one such overflow structure in the Sunnydale basin and three in the Yosemite basin.

Figure 3-2 shows the Sunnydale and Yosemite drainage basin boundaries, existing overflow points, and the location of major existing sewerage facilities. The Sunnydale basin, consisting of 986 acres, is served by a 78-inch interceptor sewer and the Candlestick tunnel. The tunnel has a 4.0-foot by 6.5-foot egg shaped cross section and a capacity of 60 million gallons per day (mgd). However, the upstream sewer aldong Harney Way has a lower capacity that restricts flow through the tunnel. The Candlestick tunnel delivers Sunnydale flow to the Yosemite basin where it is combined with the flow from the 798-acre lower Yosemite basin and pumped by the Yosemite Pump Station into a major interceptor on Thomas Avenue. The Yosemite Pump Station has a maximum capacity of 12.2 mgd and normally pumps about 4.8-mgd average dry weather flow. The interceptor on Thomas Avenue carries the discharge from the Yosemite Pump Station and the flow generated in the 552-acre upper Yosemite basin to the Hunters Point tunnel. This tunnel is a 6.5-foot circular tunnel with a potential capacity of about 120 mgd if a head of about 5 feet can be tolerated at the entrance, and if downstream constrictions are eliminated by providing additional sewer capacity. Flow delivered by the Hunters Point tunnel is combined with that of the Hunters Point basin at Keith Street and Fairfax Avenue for transport to the Southeast WPCP.

No Project Alternative

State guidelines for planning wastewater facilities require consideration of a no project alternative, i.e., a case where no action is taken and existing facilities are retained. Obviously, the no project alternative will not reduce storm-related overflows below their present average annual frequency of 46 times per year. Thus, National Pollutant Discharge Elimination System (NPDES) permit requirements calling for a reduction of overflows to one per year would be violated.

Required Facilities

There are many potential alternatives for providing the required wet weather storage and transport capacities. The two drainage basins can be combined or sewered separately. Transport can be provided through tunnels, pump stations and force mains, gravity sewers, or combinations of the three. The presence of hills between the Yosemite and Islais Creek basins dictates that the transport system must include either a tunnel or a force main in order to avoid prohibitively deep open-cut construction. Storage can be provided in offstreet reservoirs or in oversized transport facilities located under City streets.

There are a number of transport rate and storage volume combinations which could accomplish the objective of reducing overflows to one per year. A trade-off curve between maximum withdrawal rate (transport rate out of the basin) and storage volume for the Sunnydale drainage basin was developed through use of the San Francisco Macroscopic (SFMAC) model. This model simulates basin runoff, storage, withdrawal, and overflows on a hourly basis by simple mass balance calculations. Over 70 years of rainfall data are available for input to the model. The resulting trade-off curve is presented on Figure 3-3. If the existing Candlestick Tunnel were to be used at its maximum capacity of 60 mgd for withdrawal from the basin, for example, storage of approximately 10 million gallons would have to be provided in the Sunnydale basin. This trade-off curve is used to develop a number of alternatives for the Sunnydale basin transport/storage facility.

The Yosemite drainage basin can be sewered separately or in series with Sunnydale. Therefore, when evaluating the trade-off curves for the Yosemite basin, it is necessary to specify the inputs from Sunnydale. The trade-off curves for the Yosemite basin for various inputs from the Sunnydale basin are shown on Figure 3-4. The curve for 0 mgd corresponds to no direct connection between the two basins. The curve for 60 mgd corresponds to use of the Candlestick tunnel at its existing capacity, and the 90-mgd curve is for a larger withdrawal rate from Sunnydale by means of pumping or a new gravity sewer. The 140-mgd curve is for the maximum pumping rate considered for the Sunnydale Pump Station, utilizing street storage only. Using this figure, it can be seen that by withdrawing 100 mgd from Yosemite while 60 mgd is being received from Sunnydale, approximately 23 million gallons of storage would be needed in the Yosemite basin. Comparison of this storage capacity with that obtained by the 0-mgd input curve from the Sunnydale basin shows that the amount of storage required to serve Sunnydale and Yosemite in series is more than twice that required for the Yosemite basin alone. These curves are used in developing alternatives for serving Yosemite basin separately and for serving the combined Sunnydale-Yosemite basins.

For the alternatives where the two basins are combined, the selected withdrawal rates from the Sunnydale basin vary from 60 mgd, which is the capacity of the existing Candlestick tunnel, to 300 mgd, the peak wet weather flow rate generated within the Sunnydale basin from a storm with a 1-year recurrence interval. The capacity of the existing Hunters Point tunnel will be 120 mgd once downstream capacity has been increased and a head of approximately 5 feet is developed at the upstream end of the tunnel. In order to make use of the existing tunnel, the fixed withdrawal rate for the combined Sunnydale-Yosemite basins was set at 120 mgd, and the downstream Islais Creek Transport/Storage Facility was sized to accommodate this maximum flow rate. For the alternatives where the basins are separated, withdrawal rates of 50 and 70 mgd were considered from the Sunnydale and Yosemite basins, respectively, so that the total maximum flow rate through the Hunters Point Tunnel is 120 mgd and the total maximum flow rate reaching the Islais Creek Facility is 170 mgd.

Transport/Storage Planning Criteria

In developing alternatives, the following planning criteria were used:

1. If possible, transport facilities should be located in City streets or existing easements to reduce requirements for private property.

2. Offstreet storage facilities should be located on City property or vacant land available for purchase. Condemnation and relocation of existing land use activities should only be done if there is no other reasonable alternative.

3. Construction impacts should be minimized. Access to local businesses should be maintained at all times. Through traffic can be detoured if necessary to permit construction in City streets.

4. Adequate foundation conditions must exist, or means to provide adequate foundations must be available.

5. Interference with other utilities should be minimized.

6. Other significant environmental impacts should be mitigated.

7. Monetary costs should be minimized.

Development and Screening of Initial Alternatives

Based on the facility requirements and planning criteria, 21 initial alternatives were developed and screened by evaluating their monetary and nonmonetary costs. The initial planning effort is described in the Bayside Facilities Plan, Interim Report (Reference 7). In that report, Alternatives 1C, 2A, 3B, 4C, 5A, and 6E were selected for further analysis as final alternatives. The first three alternatives were directed toward a Crosstown Pump Station to be located in the vicinity of Islais Creek, whereas the last three alternatives were directed toward a Crosstown Pump Station or tunnel portal to be located at Farmers Market. Because analysis of the Crosstown Project indicated acquisition of the Farmers Market site to be infeasible, that site was eliminated from further consideration as a location for the Crosstown Pump Station or a tunnel portal. Consequently, Alternatives 4C, 5A, and 6E are no longer feasible and are eliminated from further consideration.

Pump Station or Reservoir Site Selection

In the Interim Report, potential sites for pump stations or reservoirs were identified. These sites are shown on Figure 3-5. In the Sunnydale area, Site S-3 was determined to be too small and was eliminated from further consideration. Site S-5 was also eliminated because of a combination of limited size, poor geologic conditions, and a San Mateo County location.

Further evaluation of the remaining sites during the analysis of final alternatives revealed that Sites S-1, S-4, and S-6 are in San Mateo County and are owned by Southern Pacific Railroad. Old agreements between the City and the railroad, dating back to the 1800s, may prohibit condemnation of these properties. It would take a lengthy and expensive legal process to acquire these lands, and, therefore, these sites are eliminated from further consideration. Site S-7 is located near the shoreline in San Mateo County. Acquisition and development of this site would be complicated because it is in another county and is under jurisdiction of the Bay Conservation and Development Commission and the Corps of Engineers. Based on this information, Site S-2 appears to be the best site and is selected for development of all the final alternatives.

The Real Estate Department estimates that Site S-2 can be acquired for $800,000 including relocation cost, title fees, and other related costs. It is presently used as a storage area for construction materials, which may result in minor relocation problems since an equivalent site for the same land use must be obtained for the present owner within the City. However, the City Real Estate Department advises that it should be possible to acquire the property in time for construction to start in conformance with the Master Plan Schedule because there are several vacant parcels of land in this area of the City.

The Interim Report describes ten potential pump station or reservoir sites in the Yosemite area (Figure 3-5) and eliminates Sites Y-3 and Y-6 because they are too small to accommodate a combined pump station and reservoir facility that is required for most of the Sunnydale-Yosemite alternatives. Site Y-9 was also eliminated because of its proximity to the Southeast Health Center and the potential problems of disruption of the Health Center by construction activities.

Further evaluation of the remaining seven sites during analysis of the final alternatives revealed that Sites Y-1, Y-7, and Y-10 do not provide adequate area for combined pump station and storage basin facilities and are not considered further. In addition, Sites Y-1, Y-4, and Y-7 lie along the shoreline within the boundaries of the proposed Candlestick Point State Recreation Area (CPSRA). Construction of a stroage reservoir within a recreation area would not be compatible with recreational land use. Therefore, these sites should not be used if other sites are available. The remaining three sites, Y-2, Y-5, and Y-8, are outside the park boundary and appear to have the least detrimental environmental impact. Therefore, Sites Y-2, Y-5, and Y-8 are selected for development of the final alternatives.

The Real Estate Department estimates that Site Y-2 can be acquired for $800,000 including relocation costs, title fees, and other related costs. The site is located across the street from a Redevelopment Agency housing project, so construction impacts would be significant and great care must be taken to design an odor-free facility. Most of it is owned by a construction company and is presently used as a brick storage yard; therefore, an architecturally treated and well-landscaped wastewater facility may be considered an improvement to the neighboring residents.

The northeast corner of Site Y-2, comprising about 0.6 acres, is owned by the State of California. The state is interested in acquiring the remainder of the site for inclusion in the CPSRA. The state and the City both have the power of eminent domain. However, the City cannot condemn state property, while the state can condemn City property. If competition for the site develops, the City may be hard pressed to prevail over the state, particularly in time to relocate the present owner and meet the Master Plan Schedule date for start of construction.

Sites Y-5 and Y-8 are presently owned by the City and are vacant land with no improvements. The sites are immediately adjacent to the proposed CPSRA; therefore, great care must be taken to provide a properly landscaped and odor-free facility. The Real Estate Department estimates that the market value of the two sites is $270,000 if they were sold for private development. Henceforth, the two sites are considered as one and are identified as Site Y-5.

Results of the preliminary geotechnical investigation of the final pump station and reservoir sites are presented in Tables 3-1 and 3-2. These results include an evaluation of the suitability of each site for construction of a pump station or reservoir and an overall geotechnical rating. Site S-2 is rated very good, Site Y-2 is rated good, and Site Y-5 is rated fair.

<u>Analysis of Final Alternatives</u>

In the initial analyses, storage volumes and withdrawal rates from the Sunnydale and Yosemite basins were based on the trade-off curves. This satisfied the objective of preventing overflows from occurring more than an average of once per year in conformance with the NPDES permit requirements. In analyzing the final alternatives, a second objective was addressed, namely transporting flows resulting from a storm with a 5-year recurrence interval through the sewer system without flooding City streets. The latter objective is a long-term goal of the City. Therefore, the facilities were sized to store and transport the storm flows out of the Sunnydale-Yosemite basins and into the Islais Creek Transport/Storage Facility such that no more than one overflow per year occurs on the average in the Sunnydale/Yosemite basins. In

Table 3-1 Subsurface Conditions at Potential Sites

Condition	Site		
	S-2	Y-2	Y-5
Ground surface elevation, feet			
High	+50	+25	+4
Low	+13	+2	+2
Average	+23	+3	+3
Overburden type	gravelly sand, silty sand, and silty clay	10 feet gravelly sand, 15 feet soft clay, and 5 feet sandy clay	16 feet gravelly sand, 20 feet soft clay, and 65 feet sandy clay
Overburden depth, feet			
High	15	70	162
Low	0	0	15
Average	2	25	100
Bedrock type	20 percent greenstone, 20 percent chert, and 60 percent graywacke (all highly weathered and fractured)	graywacke, highly weathered and fractured	graywacke, highly weathered and fractured
Bedrock elevation, feet			
High	+50	+25	-15
Low	0	-68	-160
Average	+22	-22	-97
Groundwater elevation, feet	+8	-2	-3
Expected bottom elevation of structure, feet	-25	-30	-35

Table 3-2 Possible Construction Methods at Potential Sites

Reservoir site	Rock excavation method	Support requirements	Probable dewatering system	Probable foundation type	Bearing capacity, psf	Uplift resistance method	Geotechnical rating
S-2	Blasting and/or ripping	Soil: 2:1 cut, or sheet piles, wales, and struts or soldier piles and lagging Rock: rock bolts or tie back system	Well points and sump pumps	Mat	Soil: 2,000 Rock: 30,000	Thick backfill above reservoir or thick mat foundation or friction piles and/or rock anchors	Very good relatively hard excavation in rock but dewatering and support problems minimal
Y-2	Blasting and/or ripping	Soil: sheet piles, wales, and struts or soldier piles and lagging Rock: rock bolts or tie back system	Well points and sump pumps or deep wells None if slurry wall is used	Mat	Soil: 1,000 Rock: 50,000	Thick backfill above reservoir or thick mat foundation or friction piles and/or rock anchors	Good relatively hard excavation in rock; dewatering and support may be difficult
Y-5	Blasting and/or ripping	Soil: slurry wall or sheet piles, wales, and struts	Deep wells or well points and sump pumps	Mat	Soil: 1,000 Rock: 50,000	Thick backfill above reservoir or thick mat founda-	Fair dewatering and support will be difficult

addition, the facilities were sized to convey the 5-year storm flow rates of 540 mgd and 810 mgd for the Sunnydale and Yosemite basins, respectively, to the bay. Wherever possible, facilities will be designed so that all overflows to the bay occur from a storage structure. The City must improve some portions of the existing upstream sewer system before a 5-year storm flow can reach the Sunnydale and Yosemite Facilities.

Further analysis and comparison of Alternatives 1C, 2A, and 3B led to an improvement in Alternative 1C and three additional alternatives which merit detailed analysis. Alternative 1C was replaced by Alternative 1C-1 to take advantage of the large capacity of the existing Alemany and Selby trunk sewers to convey wet weather flow from Sunnydale to Islais Creek. Alternative 1C envisioned an expensive new tunnel. The Alemany and Selby trunk sewers do not have adequate capacity to convey the 5-year storm flow, so a control structure would be provided at the junction of the Sunnydale line and the Alemany sewer to shut off the proposed Sunnydale Pump Station when the Alemany-Selby sewers reach capacity. In this case, Sunnydale flow would go to the Sunnydale Reservoir before eventually overflowing.

Alternative 2A-1 is an additional alternative that locates the Yosemite reservoir on Site Y-5 rather than Site Y-2 as in Alternative 2A. Site Y-5 is closer to the Hunters Point tunnel and results in a shorter force main. However, longer large pipelines are required to convey wet weather flows to the reservoir. Alternative 2A-2, another additional alternative, uses transport/storage in City streets instead of an off-line reservoir in the Yosemite area. Alternative 3B-1 is an additional alternative that includes a reservoir at Sunnydale and makes use of the existing Candlestick tunnel rather than constructing a new interceptor around Candlestick Point to the Yosemite basin.

Plans, profiles, and flow schematics are presented as a part of this report in a separate volume which show the major elements involved in each final alternative. Control structures, in which weirs, gates, or similar devices are used to control flow rates, are indicated on the plans. Junction boxes, which are structures that connect a new and an existing sewer, and locations where transport/storage structures intercept existing sewers, are also shown on the plans. The flow schematics indicate dry weather and wet weather flows. The wet weather flows are such that when the associated storage is utilized, no more than one overflow per year will occur on the long term average.

Alternative 1C-1. Major elements of Alternative 1C-1 are shown on Figure 3-6 and identified in Table 3-3. Profiles for Alternative 1C-1 are shown on Figure 3-7, and a schematic flow diagram is presented on Figure 3-8. The number of overflows in the Sunnydale and Yosemite areas would be reduced by off-line storage of wet weather flow peaks in two covered reservoirs.

Table 3-3 Major Elements, Alternative 1C-1

Element	Location	Dimensions	Capacity	Length, feet
Storage basin	Site S-2	140 x 400 x 21.5[a]	10 mil gal	
	Site Y-2	370 x 370 x 12[a]	14 mil gal	
Pumping station	Site S-2	140 x 100 x 35[b]	50 mgd	
	Site Y-2	150 x 100 x 35[b]	70 mgd	
Tunnel	None	--	--	
Interceptor/force mains	Tunnel	10 ft x 10 ft[c]		750
	Tunnel	Double 8 ft x 6.5 ft[c]		650
	Tunnel	42[c]		2,250
	San Bruno	42[c]		2,660
	Olmstead	60[c]		310
	Girard	60[c]		5,300
	Carrol	48[c]		700
	Carrol	84[c]		1,300
	Armstrong	20[c]		700
	Ingalls	20[c]		300
	Armstrong	12 ft x 10 ft[d]		700
	Ingalls	12 ft x 10 ft[d]		300
	Armstrong	72[c]		600
	Griffith	72[c]		600
	Armstrong	54[c]		600
	Griffith	54[c]		2,700
	Fairfax	78[c]		240
	Fairfax	84[c]		700
	Newhall	84[c]		250
	Evans	84[c]		450
	Third	84[c]		600
	Custer	84[c]		700
	Griffith (overflow)	Double 10 ft x 9 ft[d]		500
Transport/storage	None	--		--

[a]Side water depth.
[b]Average depth.
[c]Width by depth or diameter (in inches unless otherwise noted).
[d]Width by depth (in feet).

Wet weather flow from the Sunnydale basin would be stored in a covered reservoir at Site S-2. Overflows would be controlled by a weir in the reservoir and gates in the control structures. The overflow point would remain in its existing location. Although the overflow point is within the future CPSRA, it would be impractical to move it south out of the park because the ultimate plans for the park envision an extension along the bay shore to Coyote Point in San Mateo County. Such a relocation may be opposed by San Mateo County anyway, since the new location would still be within their county.

During wet weather, flow would be transported out of the Sunnydale basin by pumping and gravity. Flow up to 20 mgd would be transported through the the existing Candlestick tunnel to the Yosemite basin. Flow in excess of 20 mgd would be stored and pumped north through the new force main. The existing mode of operation during dry weather would not change. The pump station would only operate during wet weather when flow exceeds 20 mgd.

In the Yosemite basin, the three existing overflows would be intercepted and consolidated by routing all the flows to a covered reservoir located at Site Y-2. Wet weather flows in excess of 70 mgd, including 10 mgd from Sunnydale, would be stored. The streets selected for transport/storage elements were chosen because they provide the most direct routes from the consolidation points to Site Y-2. A new overflow would be provided from the reservoir, and overflows would be controlled by a weir and gates located at the reservoir. However, the new overflow would be constructed only if experience proves that the existing overflows are incapable of serving as overflows for the reservoir.

During wet weather, 120 mgd would be pumped out of the Yosemite basin to the portal of the existing Hunters Point tunnel. After flowing through the tunnel, 10 mgd would be diverted to the Southeast WPCP, and the remaining flow would be transported to the existing Islais Creek South Side Outfall Consolidation structure. During dry weather, flow would be pumped through a new 20-inch force main to the existing force main at the intersection of Ingalls Street and Yosemite Avenue and on to the Hunters Point tunnel. The existing Yosemite Pump Station would be abandoned. Dry weather flow from the Yosemite basin would be routed as it presently is to the Southeast WPCP.

Alternatives 2A and 2A-1. Details of Alternative 2A are shown on Figures 3-9, 3-10 and 3-11, and Table 3-4. Details of Alternative 2A-1 are shown on Figures 3-12, 3-13 and 3-14 and in Table 3-5. As in Alternative 1C-1, two covered reservoirs would provide storage to reduce the number of overflows in the Sunnydale and Yosemite basins. The major difference between Alternatives 2A and 2A-1 is the location of the Yosemite Pump Station and reservoir.

Table 3-4 Major Elements, Alternative 2A

Element	Location	Dimensions	Capacity	Length, feet
Storage basin	Site S-2	140 x 400 x 21.5[a]	10 mil gal	
	Site Y-2	340 x 340 x 12[a]	11.5 mil gal	
Pumping station	Site Y-2	200 x 100 x 35[b]	120 mgd	
Tunnel	None	--	--	
Interceptor/force mains	Tunnel	10 ft x 10 ft[c]		750
	Tunnel	Double 8 ft x 6.5 ft[c]		650
	Private	66[c]		380
	Alana	60[c]		1,300
	Harney Way	66[c]		300
	Harney Way	36[c]		60
	Ingalls	66[c]		860
	Carrol	66[c]		700
	Carrol	84[c]		1,300
	Armstrong	20[c]		700
	Ingalls	20[c]		300
	Armstrong	12 ft x 10 ft[c]		700
	Ingalls	12 ft x 10 ft[c]		300
	Armstrong	72[c]		700
	Griffith	72[c]		500
	Armstrong	66[c]		650
	Griffith	66[c]		2,650
	Fairfax	78[c]		240
	Fairfax	90[c]		700
	Newhall	90[c]		250
	Evans	90[c]		450
	Third	90[c]		600
	Custer	90[c]		700
	Griffith (overflow)	Double 10 ft x 9 ft[c]		500
Transport/storage	None	--		--

[a]Side water depth.
[b]Average depth.
[c]Width by depth or diameter (in inches unless otherwise noted).
[d]Width by depth (in feet).

Table 3-5 Major Elements, Alternative 2A-1

Element	Location	Dimensions	Capacity	Length, feet
Storage basin	Site S-2	140 x 400 x 21.5[a]	10 mil gal	
	Site Y-5	210 x 360 x 10.5[a]	7.5 mil gal	
Pumping station	Site Y-5	140 x 80 x 45[b]	120 mgd	
Tunnel	None	--	--	
Interceptor/force mains	Tunnel	10 ft x 10 ft[c]		750
	Tunnel	Double 8 ft x 6.5 ft[c]		650
	Private	66[c]		380
	Harney	66[c]		300
	Alana Way	60[c]		1,300
	Harney	36[c]		60
	Ingalls	66[c]		860
	Carrol	84[c]		2,000
	Griffith	66[c]		1,400
	Griffith	20[c]		400
	Fairfax	78[c]		240
	Fairfax	90[c]		700
	Newhall	90[c]		250
	Evans	90[c]		450
	Third	90[c]		600
	Custer	90[c]		700
	Shafter (overflow)	Double 10 ft x 9 ft[c]		900
Transport/storage	Ingalls	10 ft x 7 ft and 4 ft x 6 ft		830
	Ingalls	4 ft x 6 ft and 20 ft x 14 ft		1,150
	Thomas	4 ft x 6 ft and 20 ft x 14 ft		1,450

[a]Side water depth.
[b]Average depth.
[c]Width by depth or diameter (in inches unless otherwise noted).
[d]Width by depth (in feet).

In both alternatives, Sunnydale basin wet weather flow would be stored in a covered reservoir at Site S-2. During wet weather, 60 mgd would be transported by gravity through existing and new interceptors to the Candlestick tunnel and subsequently to the Yosemite reservoir. The Sunnydale overflow would be controlled by a weir at the reservoir and a sluice gate at the existing overflow structure. The location of the existing overflow point would not be changed. Dry weather flow would pass through the existing interceptor to the Candlestick tunnel and into the Yosemite basin.

In the Yosemite basin, the three existing overflows would be consolidated, and flow would be transported to a covered reservoir located at Site Y-2 in Alternative 2A and a combination of Sites Y-5 and Y-8 in Alternative 2A-1. Streets selected for transport/storage elements were chosen to provide the most direct routes. Wet weather flow of 120 mgd would be pumped through the Hunters Point tunnel to the Islais Creek facilities. Alternative 2A-1 provides a greater amount of storage in the transport/storage structures, thereby reducing the required reservoir capacity. In Alternative 2A, the reservoir would be near the present Yosemite overflows and would require shorter transport structures to consolidate them. In both alternatives, the new overflow would occur from the reservoir. However, the new overflow would be constructed only if experience proves that the existing overflows are inadequate to accommodate flows when the reservoir is full. If the new overflow is constructed, overflows to the dead-end slough of the South Basin Canal would be reduced to one in the case of Alternative 2A, while in Alternative 2A-1, overflows to the dead-end slough would be eliminated because the new overflow would be outside the canal. The new overflow would be controlled by a weir in the reservoir.

In both alternatives, wet weather flow would be transported by gravity to the pump station in the Yosemite basin. Since there would be no pump station at Sunnydale under these alternatives, the hydraulic grade line of the Sunnydale flow would be much lower than that of the Yosemite flow. Therefore, the Sunnydale flow would be transported to the new Yosemite Pump Station in a separate, lower compartment of a two-story transport facility so that the 60 mgd from the Sunnydale basin can be pumped directly to the Hunters Point tunnel without going into storage. This approach eliminates the necessity of constructing a deeper, more expensive reservoir. Wet weather flow of 60 mgd from the Yosemite basin would also be pumped to the Hunters Point tunnel to achieve the total withdrawal rate of 120 mgd. Yosemite flow in excess of 60 mgd would be stored in the reservoir. Combined Sunnydale and Yosemite wet weather flows would pass through the tunnel and be separated downstream so that 10 mgd goes to the Southeast WPCP and the remaining flow goes to the Islais Creek South Side Outfall Consolidation.

In Alternatives 2A and 2A-1, the existing Yosemite Pump Station would be abandoned. The new pump station in Alternative 2A would pump the Sunnydale dry weather flow and a portion of the Yosemite dry weather flow through a new 20-inch force main to the existing force main to the Hunters Point tunnel. The remaining Yosemite dry weather flow would follow its present route through the existing sewer system to the Southeast WPCP. In Alternative 2A-1, all the dry weather flow from both Sunnydale and Yosemite basins would flow to the new pump station where it would be pumped to the Hunters Point tunnel and on to the Southeast WPCP.

Alternative 2A-2. Major elements of Alternative 2A-2 are shown on Figure 3-15 and identified in Table 3-6. Profiles for Alternative 2A-2 are shown on Figure 3-16, and a schematic flow diagram is presented on Figure 3-17. The Sunnydale and Yosemite basin overflows would be reduced by storage in a reservoir in the Sunnydale basin and in-street transport/storage facilities in the Yosemite basin.

The Sunnydale facilities would be identical to those described for Alternatives 2A and 2A-1. Wet weather flow of 60 mgd would flow through Candlestick tunnel by gravity and flows exceeding 60 mgd would be stored in a covered reservoir at Site S-2. Overflows would occur at the present locations and would be controlled by a weir at the reservoir.

Wet weather flow generated in the Yosemite basin and the 60 mgd imported from the Sunnydale basin would be stored in transport/storage structures under streets within public rights-of-way in the Yosemite area. Streets selected for transport/storage elements were chosen to provide the most direct routes while avoiding streets with existing major sewers or heavy traffic. Jennings Street was selected to avoid Ingalls Street since the latter is occupied by two existing major trunk sewers. The Fitch Street, Yosemite Avenue, and Griffith Street South outfall structures would be retained for overflows. A new pump station, located at Site Y-5, would provide a 120-mgd withdrawal rate out of the Yosemite basin by pumping wet weather flow from the transport/storage structures to the Hunters Point tunnel. Following flow through the tunnel, the flows would separate downstream so that 10 mgd goes to the Southeast WPCP, and the remaining flow goes to the Islais Creek South Side Outfall Consolidation.

Dry weather flows from Sunnydale and Yosemite basins would be transported by gravity to the new pump station where they would be pumped to the Hunters Point tunnel and flow to the Southeast WPCP.

Table 3-6 Major Elements, Alternative 2A-2

Element	Location	Dimensions	Capacity	Length, feet
Storage basin	Site S-2	140 x 400 x 21.5[a]	10 mil gal	
Pumping station	Site Y-5	200 x 100 x 35[a]	120 mgd	
Tunnel	None	--	--	
Interceptor/force mains	Tunnel	10 ft x 10 ft[c]		750
	Tunnel	Double 8 ft x 6.5 ft[c]		650
	Private	66[c]		380
	Alana Way	60[c]		1,300
	Harney	66[c]		300
	Griffith	66[c]		1,200
	Harney	36[c]		60
	Shafter	20[c]		250
	Fairfax	78[c]		240
	Fairfax	90[c]		700
	Newhall	90[c]		250
	Evans	90[c]		450
	Third	90[c]		600
	Custer	90[c]		700
Transport/storage	Fitzgerald	20 x 13[d]		680
	Jennings	20 x 14[d]		2,540
	Underwood	20 x 16[d]		1,230
	Hawes	20 x 16[d]		350
	Thomas	20 x 17[d]		850
	Carroll	20 x 12[d]		700
	Griffith	20 x 12[d]		550
	Armstrong	20 x 12[d]		2,000

[a]Side water depth.
[b]Average depth.
[c]Width by depth or diameter (in inches unless otherwise noted).
[d]Width by depth (in feet).

Alternatives 3B and 3B-1. Details of Alternative 3B are shown on Figures 3-18, 3-19 and 3-20 and in Table 3-7. Details of Alternative 3B-1 are shown on Figures 3-21, 3-22 and 3-23 and in Table 3-8. Both alternatives would utilize a tunnel to facilitate gravity flow from the Yosemite basin to Islais Creek.

Flows from the Sunnydale basin are handled differently in the two alternatives. Alternative 3B would have no storage in the Sunnydale basin. A combination of a new interceptor and the existing Candlestick tunnel would provide gravity transport for the 1-year storm flow of 300 mgd. The location of the Sunnydale overflow would not be changed, and overflows would be controlled by a gate in the control structure on the existing Sunnydale trunk sewer. In Alternative 3B-1, Sunnydale wet weather flow up to 60 mgd would travel by gravity through the Candlestick tunnel, and flows exceeding 60 mgd would overflow into a covered reservoir at Site S-2. Dry weather flow from Sunnydale would be conveyed as it is at present.

In Alternative 3B, the 1-year flow of 300 mgd from the Sunnydale basin would combine with wet weather flow from the Yosemite basin and be stored in transport/storage facilities in the Yosemite area. In Alternative 3B-1, 60 mgd of wet weather flow from the Sunnydale basin would combine with wet weather flow from the Yosemite basin and be stored in Yosemite transport/storage facilities. Streets were chosen for transport/storage elements in the same manner as for Alternative 2A-2. In both alternatives, the Fitch Street and Yosemite outfall structures would be utilized for overflows. The Griffith Street South Outfall would be utilized under Alternative 3B, but it would be intercepted and abandoned under Alternative 3B-1. A new tunnel would provide gravity flow up to 110 mgd from the Yosemite transport/storage facilities to the Islais Creek facilities. An additional 10 mgd would follow its present route by gravity through the existing Hunters Point tunnel to the Southeast WPCP.

The alignment for the new tunnel was developed to achieve minimum cost with the least detrimental environmental impacts. Construction methods, rather than hydraulics, dictate 9 feet as the most economical diameter for the tunnel. The selected alignment takes advantage of two vacant sites that can be used as access portals during construction and is the shortest distance between the portals. Although the tunnel could be routed under Third Street to reduce the percentage of the tunnel's length that runs under private property, the resulting alignment would be longer, and the construction would be more difficult because of increased mixed face conditions encountered along the Third Street alignment. Both of these factors would make the alternatives more expensive.

Table 3-7 Major Elements, Alternative 3B

Element	Location	Dimensions	Capacity	Length, feet
Storage basin	None	--	--	
Pumping station	None	--	--	
Tunnel	Roughly parallels Third Street	8.5 ft	--	6,200
Interceptor/force mains	Alana	84[c]		1,300
	Harney	84[c]		2,300
	Private	66[c]		350
	Public (Candlestick)	84[c]		1,700
	Gilman	84[c]		1,300
	Fitch	84[c]		1,150
	Phelps	90[c]		400
	Davidson	90[c]		1,800
Transport/storage	Fitzgerald	20 x 12[d]		700
	Jennings	20 x 13[d]		1,390
	Jennings	20 x 15[d]		1,150
	Carroll	20 x 13[d]		700
	Griffith	20 x 13[d]		600
	Armstrong	20 x 14[d]		1,950
	Underwood	20 x 14[d]		1,300
	Hawes	20 x 13[d]		260
	Thomas	20 x 13[d]		660

[a]Side water depth.
[b]Average depth.
[c]Width by depth or diameter (in inches unless otherwise noted).
[d]Width by depth (in feet).

Table 3-8 Major Elements, Alternative 3B-1

Element	Location	Dimensions	Capacity	Length, feet
Storage basin	Site S-2	140 x 400 x 21.5[a]	10 mil gal	--
Pumping station	None	--	--	--
Tunnel	Roughly parallels Third Street	Diam = 8.5 ft	--	6,200
Interceptor/force mains	Tunnel	10 ft x 10 ft[b]		750
	Tunnel	Double 8 ft x 6.5 ft[b]		650
	Private	66[b]		380
	Alana	60[b]		1,300
	Harney	66[b]		300
	Harney	36[b]		60
	Phelps	90[b]		400
	Davidson	90[b]		1,800
	Griffith	90[b]		500
Transport/storage	Fitzgerald	20 x 13[c]		680
	Jennings	20 x 14[c]		2,540
	Carroll	20 x 12[c]		700
	Griffith	20 x 12[c]		550
	Armstrong	20 x 12[c]		2,000

[a]Side water depth.
[b]Width by depth or diameters (in inches unless otherwise noted).
[c]Width by depth (in feet).

In both alternatives, the existing mode of operation would be retained for dry weather flow. The Yosemite Pump Station would be retained, and dry weather flow from both basins would continue through the existing Hunters Point tunnel to the Southeast WPCP.

Cost Estimates. The unescalated cost estimates at ENR 3800 for the final alternatives are presented in Tables 3-9 through 3-14. Total present worths and equivalent annual costs are also shown. The methods used in developing these cost estimates are explained in Chapter 1 of this report.

Construction Employment. The amounts of direct construction labor and secondary employment that would be generated by implementing the Sunnydale-Yosemite alternatives are presented in Table 3-15. Secondary employment is that required to support the construction such as providing the basic construction materials (cement, pipe, etc.) or manufacturing pumps and other equipment items.

Solids Transport. The transport/storage elements have been designed to maintain a minimum velocity of 2 feet per second under normal operating conditions in order to keep solids in suspension. However, velocities in large transport/storage facilities will decrease below 2 feet per second as storage increases in relation to the withdrawal rate. During such times, solids will settle. These solids must be removed from the facilities in order to prevent odors. Several methods of removing settled solids have been evaluated including manual cleaning with shovels, manual flushing with fire hoses, flushing with an installed system of pipes and nozzles, and flushing using gates in the transport/storage elements to sequentially flush downstream sections with stored water. Installation of a system of pipes with nozzles near the bottom of the walls of the transport/storage structures appears to be the most practical method because it does not require a large supply of manual labor, and clean water is used for flushing. Flushing with storred storm water does not completely eliminate the possibility that some solids may remain as flushing velocities decrease. Flushing with storred storm water would also require installation of a sophisticated system of large control gates.

The pipe and nozzle flushing system would require a flow of 30 gallons per minute (gpm) per foot of length of structure at a discharge pressure of 150 pounds per square inch gage (psig). If a 100-foot length of structure were flushed at a time, 3,000 gpm would be required. Four potential sources of flushing water include the City's domestic water system, treated effluent from the Southeast WPCP, groundwater from wells, and decanted raw wastewater from the transport/storage facilities themselves. Bay water is unsuitable because the salt water would corrode the pumps, pipes, and nozzles and attack the concrete structures. In addition, the

Table 3-9 Estimated Cost of Sunnydale-Yosemite Transport/Storage Facility, Alternative 1C-1

Cost item	Cost, million dollars
Stage III (and II)	
Structural	59.5
Mechanical and electrical	12.8
Site preparation	1.2
Total construction	73.5
Land	1.89
Total capital	104.4
Annual energy	0.096
Annual labor and materials	0.267
Total annual O&M	0.363
Capital less salvage value	97.5
Present worth of O&M	2.63
Total present worth	100.1
Equivalent annual total cost	9.54

Table 3-10 Estimated Cost of Sunnydale-Yosemite Transport/Storage Facility, Alternative 2A

Cost item	Cost, million dollars
Stage III (and II)	
Structural	51.6
Mechanical and electrical	11.5
Site preparation	1.2
Total construction	64.3
Land	2.42
Total capital	92.1
Annual energy	0.065
Annual labor and materials	0.252
Total annual O&M	0.317
Capital less salvage value	85.9
Present worth of O&M	2.30
Total present worth	88.2
Equivalent annual total cost	8.40

Table 3-11 Estimated Cost of Sunnydale-Yosemite Transport/Storage Facility, Alternative 2A-1

Cost item	Cost, million dollars
Stage III (and II)	
Structural	55.2
Mechanical and electrical	11.4
Site preparation	1.2
Total construction	67.8
Land	2.24
Total capital	96.8
Annual energy	0.065
Annual labor and materials	0.242
Total annual O&M	0.307
Capital less salvage value	90.0
Present worth of O&M	2.22
Total present worth	92.2
Equivalent annual total cost	8.79

Table 3-12 Estimated Cost of Sunnydale-Yosemite Transport/Storage Facility, Alternative 2A-2

Cost item	Cost, million dollars
Stage III (and II)	
Structural	62.2
Mechanical and electrical	12.2
Site preparation	1.2
Total construction	75.6
Land	2.24
Total capital	107.7
Annual energy	0.065
Annual labor and materials	0.256
Total annual O&M	0.321
Capital less salvage value	100.4
Present worth of O&M	2.33
Total present worth	102.7
Equivalent annual total cost	9.79

Table 3-13 Estimated Cost of Sunnydale-Yosemite Transport/Storage Facility, Alternative 3B

Cost item	Cost, million dollars	Incremental costs to other alternatives	Total 3B cost
Stage III (and II)			
Structural	79.2	7.0	86.2
Mechanical and electrical	2.9	4.1	7.0
Site preparation	0.0	0.0	0.0
Total construction	82.1	11.1	93.2
Land	0.14	0.0	0.14
Total capital	-	-	130.1
Annual energy	0.011	0.019	0.03
Annual labor and materials	0.068	0.040	0.108
Total annual O&M	0.079	0.059	0.138
Capital less salvage value	-	-	120.9
Present worth of O&M	-	-	1.00
Total present worth	-	-	121.9
Equivalent annual total cost	-	-	11.6

Table 3-14 Estimated Cost of Sunnydale-Yosemite Transport/Storage Facility, Alternative 3B-1

Cost item	Cost, million dollars	Incremental costs to other alternatives	Total 3B-1 cost
Stage III (and II)			
Structural	63.8	7.0	70.8
Mechanical and electrical	4.6	4.1	8.7
Site preparation	0.3	0.0	0.3
Total construction	68.7	11.1	79.8
Land	1.87	0.0	1.87
Total capital	-	-	113.2
Annual energy	0.011	0.019	0.030
Annual labor and materials	0.120	0.040	0.160
Total annual O&M	0.131	0.059	0.190
Capital less salvage value	-	-	105.1
Present worth of O&M	-	-	1.38
Total present worth	-	-	106.4
Equivalent annual total cost	-	-	10.1

Table 3-15 Construction Employment for Sunnydale-Yosemite Transport/Storage Alternatives

Alternative	Direct construction employment, worker-years	Secondary employment, worker-years
1C-1	460	1,250
2A	400	1,090
2A-1	420	1,150
2A-2	470	1,280
3B	580	1,580
3B-1	500	1,360

use of saltwater might upset the biological treatment processes at the Southeast WPCP. The method of flushing the transport/storage system is discussed in greater detail in Chapter 5 of this report.

Utilization of Scarce Resources. The two significant scarce resources considered in the analysis of the Sunnydale-Yosemite consumed by these alternatives are land and energy. Sites utilized by the final alternatives are shown on Figure 3-5 and were described previously. Energy requirements of the final alternatives are presented in Table 3-16. The peak demands can be supplied by Pacific Gas and Electric Company (PGandE) through their existing system except for the large peak demand of 2,500 kilowatt (kw) at Sunnydale under Alternative 1C-1 where a line extension would be required. Alternative 1C-1 consumes almost twice as much energy as Alternative 3B and 25 percent to 60 percent more energy than the other alternatives.

In addition to the energy required by the Sunnydale-Yosemite Facility, the Bayside Facilities system will include the Crosstown Pump Station which will consume substantial amounts of energy. See the Crosstown Project Report for more information on the Crosstown Pump Station. Since the wet weather flow is not lifted by pumping at Yosemite under Alternatives 3B and 3B-1, wet weather flow will arrive at Islais Creek 15 feet deeper under these alternatives than other alternatives. Consequently, a portion of the Crosstown Pump Station must be deepened, and higher head pumps must be used. The increased head will cause an additional electrical energy demand of 330 kw at the Crosstown Pump Station, and the increased power consumption will be 51,000 kilowatt-hour (kwhr) per year.

Traffic Impacts and Spoil Removal. There will be no long-term significant traffic problems associated with the final alternatives since the facilities are unmanned and traffic will be limited to periodic visits by maintenance personnel. During construction, however, significant traffic impacts may occur.

The Sunnydale-Yosemite Facilities are located in the predominately industrial southeast quadrant of the City. The most significant impacts generated by the various alternatives would be access disruptions caused by construction of wide cast-in-place transport/storage structures. Mitigation strategies should include proper traffic diversion tactics where street closure is necessary and proper street signing and delineation tactics throughout the construction zones.

Construction activities on Armstrong, Carroll, and Fitzgerald Avenues would reduce street capacity. Construction activities on Thomas Avenue, Hawes Street, and Underwood Avenue traverse industrial development fringing on vacant land. Other than impeding truck access to the buildings fronting these streets, the only disruption is to the naval shipyard rail line at various

Table 3-16 Energy Requirements for Final Sunnydale-Yosemite Transport/Storage Alternatives

Alternative	Peak demand, kw		Energy use million kwhr/yr	Residential equivalent[a]
	Sunnydale facilities	Yosemite facilities		
1C-1	2,500	1,070	1.0	150
2A	826	1,445	.80	120
2A-1	826	1,410	.66	100
2A-2	826	1,580	.66	100
3B	0	690[b]	.59	90
3B-1	826	690[b]	.62	95

[a]Residential equivalent is the number of Bay Area residences which would consume the same annual energy as the alternative, based on PGandE data showing single-family residential energy use in the Bay Area to be 6,600 kwhr per year without air conditioning.

[b]Represents demand for existing Yosemite pumping station, retained for dry weather flow, plus additional electrical energy demand of 330 kw to account for increased head at the Crosstown Pumping Station.

points. In most cases, disruption to the rail lines can be mitigated by boring under the tracks. Disruption of the spur tracks running down Armstrong Avenue between Jennings and Ingalls Streets under Alternatives 2A-2, 3B, and 3B-1 would be difficult to mitigate because the track is in the center of the street. The track would probably have to be removed from service and replaced following construction.

In the Sunnydale area, construction activities on Tunnel Avenue south of Visitacion Avenue would severely reduce the street capacity, especially in the front of the CECO building. Construction activities on Carroll Avenue and Harney and Alana Ways would reduce street capacity which would be critical during game days at Candlestick Stadium. Alana Way construction would also impede access to the new Executive Office Park development.

All the alternatives except 3B and 3B-1 have some common potential traffic impacts. Construction activities along Custer, Evans, and Fairfax Avenues would reduce street capacity, but two through traffic lanes may still be provided on these streets. Construction activities along Third Street would disrupt through traffic and may cause peak-hour traffic congestion in the vicinity of the Third Street and Evans Avenue intersection. Construction activity on Griffith Street north of the South Basin Canal would reduce street capacity to the extent that only one through traffic lane may be provided.

Because Alternatives 3B and 3B-1 include a tunnel with construction activity concentrated at the portals, certain potential traffic impacts are common to these two alternatives. Portal openings in the vicinities of the Third Street-Evans Avenue and the Jennings Street-Armstrong Avenue intersections would increase vehicular traffic activity and parking space demand in each local area. Existing local parking demand is generated by the industrial activities. Recent on-street parking surveys during weekday middays within some 700 feet of the portal sites indicate 64 of 369 spaces were used the Third Street-Evans Avenue site at Third/Evans while 310 of 397 spaces were used at the Jennings Street-Armstrong Avenue site. Tunnel construction would take up an additional 47 spaces at each site.

Alternative 3B includes a major pipeline through the Candlestick Stadium parking lot. Construction of this element would have a very serious impact on activities at the stadium. This impact could be mitigated by concentrating construction between January and April when neither the Giants nor the 49ers are playing. Also, construction during midweek between October and January may be possible if the trench is backfilled before Sunday home games.

Under Alternatives 1C-1 and 2A, construction activities on Armstrong Avenue would affect the adjacent lumber yard activities. Internal yard operations would be disrupted, but no through traffic impacts would result. Under alternatives 2A-2, 3B and 3B-1, construction activities on Jennings Street would cause closure of the street to through traffic for several months which would result in adverse access and parking impacts.

Alternative 1C-1 is unique in that it has a major force main and gravity sewer elements that traverse the Visitacion Valley and Portola residential districts along Bayshore Boulevard, San Bruno Avenue, and Girard Street which would have an adverse impact on these streets for several months as construction progresses along the route.

Spoils are the excess dirt and rock excavated during the construction of the facilities which cannot be replaced as backfill and must be hauled off by truck for disposal elsewhere. The volumes of loose spoils produced by the final alternatives are presented in Table 3-17. This material will be exported by dump trucks over the local streets to the Bayshore Boulevard interchange of U.S. 101 and onto disposal sites in San Mateo County. Restrictions may be placed on using specific streets for haul routes. In order to avoid spilling dirt, trucks will not be overloaded. Speed limits will be enforced. Truck wheels will be hosed off if necessary due to muddy conditions before leaving the construction sites. Haul route recommendations specific to the apparent best alternative project are presented in Chapter 5 of this report.

The traffic and access impacts of the Sunnydale-Yosemite alternatives are summarized in Table 3-18. Four areas of impact are shown: (1) construction truck traffic on surface streets, i.e., arterials, collectors, and local streets with the impact expressed as peak truck travel in miles per day on such streets; (2) impact of in-street, open-cut construction on traffic on various types of streets with the impact expressed as days of disruption of arterials (A), collectors (C), and local (L) streets and identification of the existing traffic load conditions on the impacted streets, i.e., light (L), moderate (M), or heavy (H) traffic volume; (3) parking impact of the construction activities, expressed as curb spaces either occupied by the actual construction work or by construction worker vehicles; and (4) impact on commercial, industrial, residential, and other access with the impact expressed as days of disruption. During construction of pipelines and transport/storage facilities, the work area which produces the impacts will move steadily along the project alignment and will only impact any one location for a relatively brief period.

Community Disruption. Construction of any alternative will create some community disruption primarily consisting of the traffic impacts previously described. The potential short-term

Table 3-17 Construction Spoils From Sunnydale-Yosemite Transport/Storage Alternatives

Alternative	Loose volume, cu yd
1C-1	630,000
2A	555,000
2A-1	440,000
2A-2	545,000
3B	515,000
3B-1	500,000

Table 3-18 Traffic and Access Impacts for Sunnydale-Yosemite Transport/Storage Alternatives

Impact	Alternative					
	1C-1	2A	2A-1	2A-2	3B	3B-1
Construction truck traffic on surface streets						
Peak volume, trucks per day	320	284	252	212	148	207
Round trip distance, miles	9.7	6.6	7.2	6.8	10.8	11.7
Peak truck travel, miles per day	766	590	573	405	416	373
In-street construction traffic impact by street type, days						
Arterial heavy	58	15	15	15	0	0
Arterial medium	113	0	0	0	0	0
Arterial light	0	0	0	0	0	0
Collectors heavy	0	0	0	0	0	0
Collectors medium	32	30	30	30	0	0
Collectors light	156	60	60	60	113	60
Local heavy	0	0	0	0	0	0
Local medium	0	48	48	48	63	48
Local light	643	417	600	880	860	628
Parking impact, curb spaces						
In-street construction	60	60	60	60	60	60
Off-street construction	140	130	130	90	94	134
Access impact, days						
Commerical/industrial	599	515	670	887	874	602
Residential	358	10	10	68	68	68
Railroad	48	48	53	192	169	159
Other	46	45	73	78	94	56

disruption of businesses is summarized in Table 3-19. The construction of the Sunnydale reservoir and pipelines under all alternatives but 3B might affect the Sunshine Salvage property, potentially disrupting business and resulting in indiscriminate dumping by the public. Construction along Griffith Street in Alternatives 1C-1, 2A, 2A-1, and 2A-2 could impair truck access to the Bayview Industrial Park and to the ends of Van Dyke and Underwood Streets. The latter might affect Cahill Construction and K&H Manufacturing. Armstrong Avenue, between Jennings and Ingalls Streets, is a busy block. Marcon-Flo Research and Western Piping might have their only access to this street affected by Alternatives 2A-2, 3B, and 3B-1. In the Davidson Avenue area, access to the Seamodal loading docks on Fairfax Avenue could be impaired under Alternatives 1C-1, 2A, 2A-1, and 2A-2. On Davidson Avenue between Third and Quint Streets, the drive-in door to Peter's Moving and Storage and truck access to five other small businesses might be impaired under Alternatives 3B and 3B-1.

Flexibility. Alternatives 1C-1, 2A, 2A-1, and 2A-2 are flexible because the Sunnydale/Yosemite facilities would still be usable if the downstream facilities in Islais Creek are not constructed. In this case, pumping rates from each basin could be reduced to match available treatment capacity at the Southeast WPCP. Overflows would be reduced below present levels, but not to the NPDES permit level of one overflow per year. If the Islais Creek facilities are constructed and overflow requirements become more stringent in the future, these alternatives provide flexibility because additional storage could be added. Alternatives 3B and 3B-1 are not particularly flexible because the withdrawal rate from the basin cannot easily be increased if the overflow standards become more stringent. Furthermore, these alternatives are not usable if the Crosstown Pump Station is not constructed.

Reliability. The reliability of Alternatives 1C-1, 2A, 2A-1, and 2A-2 are dependent upon the performance of the pump stations. The wet weather pumps will be used about 80 times per year. It is estimated that each pump station might average four pumps and each pump might break down once every 5 years. From an analysis of the distribution of pumping rates, it is estimated that all four pumps will be needed only about half the time the pump station is operating. Therefore, the chances of a pump failing when it is needed is one out of 800 pumping events (one out of 80 events per year x 5 years ÷ 0.5 use factor = one out of 800 events). Such a failure record would increase the annual average number of overflows less than 0.1 percent or 0.001 overflows per year. Therefore, the reliability of the alternatives against equipment breakdown is very high.

Power failures are a more likely occurrence than equipment breakdown. Standby power will be provided for dry weather flow only. A power failure during wet weather would cause an overflow

Table 3-19 Potential Short-Term Disruption of Business Caused by Sunnydale-Yosemite Alternatives

Alternative	Sunnydale area	Yosemite area	Davidson Street area
1C-1	Sunset Scavenger, Ceco Corporation	Bayview Industrial Park, Cahill Construction, K & H Manufacturing, Ricci-Kruse Lumber Co., Molinari Salami Yard, Caesar's Backhoe Service.	Seamodal, Peeter's Moving & Storage plus five small businesses. Disruption along rail line.
2A	Sunset Scavenger, Ceco Corporation	Bayview Industrial Park, Cahill Construction, K & H Manufacturing, Ricci-Kruse Lumber, Molinari Salami, Caeser's Backhoe Service.	Seamodal, Peeter's Moving & Storage, plus five small businesses. Disruption along rail line.
2A-1	Sunset Scavenger, Executive Park, Ceco Corporation	Bayview Industrial Park, Cahill Construction, K & H Manufacturing, Ricci-Kruse Lumber, plus 31 businesses (10 on Donner).	Seamodal, Peeter's Moving & Storage, plus five small businesses. Disruption along rail line.
2A-2	Sunset Scavenger, Executive Park, Ceco Corporation	Bayview Industrial Park, Cahill Construction, K & H Manufacturing, Marcon-Flo Research, Western Piping, Ricci-Kruse Lumber Co., Molinari Salami, Caesar's Backhoe, Caterer's Best Sandwiches. Disruption along rail spur.	Seamodal, Peeter's Moving & Storage, plus five small businesses. Disruption along rail line.
3B	Sunset Scavenger, Chet C. Smith Company, Candlestick Stadium	Marcon-Flo Research, Western Piping, Ricci-Kruse Lumber Company, Molinari Salami Company, Caesar's Backhoe, Caterer's Best Sandwiches. Disruption along rail spur.	Five small businesses, two auto salvage yards, 76 Station. Disruption across rail line.
3B-1	Sunset Scavenger, Ceco Corporation	Marcon-Flo Research, Western Piping, Ricci-Kruse Lumber Company, Molinari Salami Company, Caesar's Backhoe, Caterer's Best Sandwiches. Disruption along rail spur.	Five small businesses, two auto salvage yards, 76 Station. Disruption across rail line.

if the storage is full. Chances of an operator error would be minimal with the proposed supervisory control system and alarms and equipment interlocks.

Facilities will be designed to applicable seismic standards. If a very large earthquake occurs which causes structural failures, hazards to public safety would be minimal since all major facilities are belowground. Pump stations and reservoirs would be located within areas restricted by fencing. Force mains would be shut down in the event of a large earthquake to prevent uncontrolled discharge of raw wastewater from a broken pipe.

The reliability of Alternatives 3B and 3B-1 is good since there is no mechanical equipment which could break down, with the exception of the Crosstown Pump Station which is common to all alternatives. Power outages would not affect Alternatives 3B and 3B-1 since there is no electrical demand (in Sunnydale-Yosemite) for pumping wet weather flow. A power outage in dry weather could be accommodated by storing dry weather flow in the wet weather storage thereby avoiding a bypass. Historically, power outages have been infrequent and short in duration.

Implementability. Alternatives 1C-1, 2A, 2A-1, and 2A-2 are relatively easy to implement. In the Sunnydale area, the reservoir site is privately owned and must be acquired. An easement is required from Caltrans for the north end of the 60-inch interceptor in Alternative 1C-1 where it passes under the U.S. 101-Interstate 280 interchange. In the Yosemite basin, Site Y-2, required for Alternative 2A, is privately owned and must be acquired. In addition, Alternative 2A requires an easement for the pipelines crossing the South Basin Canal within the CPSRA. Alternatives 2A-1 and 2A-2 are easier to implement because Site Y-5 is City property and does not need to be acquired. Alternatives 3B and 3B-1 are not particularly easy to implement since the proposed tunnel is largely under private property, and easements would be required for properties on 20 blocks. Any final alternative can be built within the 35-month construction period provided in the City's Master Plan Schedule. Several permits or approvals are required to implement any of the final alternatives; these requirements are listed in Table 3-20.

Compatibility With Adjacent Land Use. Impacts of the final alternatives on adjacent land use will be either short- or long-term. Short-term land use impacts will result from open-cut construction activities. Open-cut construction occurs mainly within street rights-of-way and will not require land use changes. Tunnel construction land use impacts will be limited to short-term impacts at the portals. Long-term land use impacts will result from construction of pump stations and reservoirs on specific sites. Table 3-21 presents the potential long-term land use impacts resulting from construction at specific station or reservoir sites and tunnel portals.

Table 3-20 Agencies Granting Permits or Approval Required for Sunnydale-Yosemite Alternatives

Agency	Alternative					
	1C-1	2A	2A-1	2A-2	3B	3B-1
Bay Conservation and Development Commission	X	X	X	X	X	X
Caltrans	X	X	X	X	X	X
San Francisco Port Commission	X	X		X	X	X
State Department of Parks and Recreation	X	X	X	X	X	X
San Francisco Department of Parks and Recreation					X	
Corps of Engineers	X	X	X			X
San Francisco Planning Commission	X	X	X	X	X	X
San Francisco Art Commission	X	X	X	X	X	X
San Francisco Bureau of Building Inspection	X	X	X	X	X	X
County of San Mateo	X	X	X	X	X	X
United States Navy	X	X	X	X	X	X
Environmental Protection Agency	X	X	X	X	X	X
State Water Resources Control Board	X	X	X	X	X	X
Bay Area Air Quality Management District	X	X	X	X	X	X
Regional Water Quality Control Board	X	X	X	X	X	X
San Francisco Board of Supervisors	X	X	X	X	X	X

Table 3-21 Potential Land Use Impacts, Sunnydale-Yosemite Alternatives

Location	Alternatives					
	IC-1	2A	2A-1	2A-2	3B	3B-1
Sunnydale Area (Candlestick Cove School)	Impact on rehab and development of Candlestick Cove School and Little Hollywood Park.	Impact on rehab and development of Candlestick Cove School and Little Hollywood Park.	Impact on rehab and development of Candlestick Cove School and Little Hollywood Park	Impact on rehab and development of Candlestick Cove School and Little Hollywood Park	-	Impact on rehab and development of Candlestick Cove School and Little Hollywood Park
Yosemite area	Impact on planning and development of Candlestick Point State Recreation area--access	Impact on planning and development of Candlestick Point State Recreation area--access	Impact on planning and development of Candlestick Point State Recreation area--marsh restoration	Impact on planning and development of Candlestick Point State Recreation area--marsh restoration	-	-
Phelps and Third Street	-	-	-	-	Conflict with Redevelopment Agency proposed Bay View Triangle Project.	Conflict with Redevelopment Agency proposed Bay View Triangle Project.
Tunnel/Girard	Temporary disruption of community linkages and commercial uses	-	-	-	-	-
Harney Park/ Gilman	-	-	-	-	Temporary disruption of Yerby Project, Bay View Hill, Candlestick Point State Recreation area.	
Griffith Ave.	Temporary disruption of Bay View Industrial Park and public housing.	Temporary disruption of Bay View Industrial Park and public housing.	Temperory disruption of Bay View Industrial Park and public housing.	Temporary disruption of Bay View Industrial Park and public housing.	-	-
Phelps and Fairfax	-	-	-	-	Temporary impact on Bay View Industrial Triangle.	Temporary impact on Bay View Industrial Triangle.
Fairfax and Mendell	Conflict with post office construction in India Basin Industrial Park.	Conflict with post office construction in India Basin Industrial Park.	Conflict with post office construction in India Basin Industrial Park.	Conflict with post office construction in India Industrial Park.	-	-

Compatibility with the proposed CPRSA is of particular importance. Short-term construction impacts will occur under Alternatives 1C-1 and 2A because of the necessity to install two pipelines across the South Basin Canal within the CPSRA. Under Alternative 3B-1, a single pipeline would be installed across the canal. Alternative 2A-1 would have no elements within the CPSRA, except the southeast end of the Carroll Avenue pipeline (less than 300 feet to the Fitch Street connection). The three existing outfalls to the South Basin Canal would be retained under Alternatives 2A-2 and 3B, although they would be modified by the provision of control structures, two of which would be within the boundary of the CPSRA. The Griffith Street South Outfall would be eliminated under Alternative 3B-1, although the Yosemite and Fitch Street outfalls would be controlled and retained. The three existing outfalls would be consolidated under Alternatives 1C-1, 2A, and 2A-1, but the existing outfalls would remain in service to provide for overflow when the reservoir is full. If experience proves that this approach is impractical, the three existing outfalls would be eliminated and replaced with a single overflow out of a new storage reservoir. Alternative 2A-1 has the advantage of relocating any new overflow outside of the South Basin Canal which is a dead-end slough.

Bypass Analysis. Under all the alternatives bypassing the Sunnydale facilities is possible since the existing Sunnydale trunk sewer would not be plugged and the control gate at the Sunnydale outfall structure could be opened to allow overflow. In all Alternatives bypasses of flows in excess of a 1-year storm could occur around the Sunnydale facilities through the existing Sunnydale trunk sewer and outfall.

Bypasses around the Yosemite facilities would not occur under Alternatives 1C-1, 2A, and 2A-1 because the existing outfalls would be plugged, flows would be transported to the new pump station and reservoir, and a new overflow would be provided from the reservoir. Thus, flows would have to pass through the new facilities in order to overflow. Under Alternatives 2A-2, 3B, and 3B-1, the existing outfalls are retained and bypasses could occur under these alternatives if a storm greater than a 1-year storm should inundate the in-street storage capacity.

Flood Protection Analysis. The Sunnydale/Yosemite area is subject to local flooding during large storms because some existing sewers are inadequate. The proposed pump stations and reservoirs in the Yosemite area may be subject to flooding because they are located on low terrain near the downstream ends of the existing sewer system. Therefore, they must be designed for protection against flooding by placing motors and electrical equipment above the floodplain, providing adequate sump pumps, or providing drainage systems to keep flood waters out of the structures. Table 3-22 presents the inadequate sewers that are relieved by each of the final alternatives.

Table 3-22 Inadequate Sewers Relieved by Sunnydale-Yosemite

Alternative	Description of inadequate sewer			
	Location	From	To	Length, feet
1C-1	Sunnydale Trunk	-	-	2,200
2A	Sunnydale Trunk	-	-	550
2A-1	Sunnydale Trunk	-	-	550
	Griffith St.	Thomas Ave.	Underwood Ave.	300
	Griffith St.	Revere Ave.	Quesada Ave.	300
	Ingalls St.	Fitzgerald Ave.	Yosemite Ave.	1,700
	Bancroft Ave.	Jennings St.	Ingalls St.	700
2A-2	Sunnydale Trunk	-	-	550
	Jennings St.	Fitzgerald Ave.	Egbert Ave.	300
	Ingalls St.	Bancroft Ave.	Yosemite Ave.	550
	Egbert Ave.	Jennings St.	Ingalls St.	700
	Bancroft Ave.	Jennings St.	Ingalls St.	700
	Yosemite Ave.	Jennings St.	Ingalls St.	700
	Hawes St.	Shafter Ave.	Thomas Ave.	300
	Shafter Ave.	Hawes St.	Griffith St.	650
	Griffith St.	Revere Ave.	Quesada Ave.	300
3B	Sunnydale Trunk	-	-	550
	Jennings St.	Fitzgerald Ave.	Egbert Ave.	300
	Ingalls St.	Bancroft Ave.	Yosemite Ave.	550
	Egbert Ave.	Jennings St.	Ingalls St.	700
	Bancroft Ave.	Jennings St.	Ingalls St.	700
	Yosemite Ave.	Jennings St.	Ingalls St.	700
	Hawes St.	Shafter Ave.	Thomas Ave.	300
	Shafter Ave.	Hawes St.	Griffith St.	650
	Griffith St.	Revere Ave.	Quesada Ave.	300
	Jennings St.	Underwood Ave.	Thomas Ave.	300
	Thomas Ave.	Jennings St.	Hawes St.	1,300
	Newhall St.	Innes Ave.	Galvez Ave.	500
	Ingalls St.	Armstrong Ave.	Yosemite Ave.	300
3B-1	Sunnydale Trunk	-	-	550
	Jennings St.	Fitzgerald Ave.	Egbert Ave.	300
	Ingalls St.	Bancroft Ave.	Yosemite Ave.	550
	Egbert St.	Jennings St.	Ingalls St.	700
	Bancroft Ave.	Jennings St.	Ingalls St.	700
	Yosemite Ave.	Jennings St.	Ingalls St.	700
	Hawes St.	Shafter Ave.	Thomas Ave.	300
	Shafter Ave.	Hawes St.	Griffith St.	650
	Griffith St.	Revere Ave.	Quesada Ave.	300
	Jennings St.	Underwood Ave.	Thomas Ave.	300
	Thomas Ave.	Jennings St.	Hawes St.	1,300
	Newhall St.	Innes Ave.	Galvez Ave.	500

Public Acceptability. Public acceptability of the final alternatives for the Sunnydale-Yosemite Facility will likely hinge on the short-term construction impacts of each alternative which are summarized in Table 3-23. These impacts include effects on residential access; health and social services; recreation, school and day care facilities; community organizations; cultural facilities; and community cohesion.

Long-term visual effects are expected to be minimal since the facilities will be either buried or designed with small building envelopes which will be architecturally treated. However, during construction, there will be temporary visually disruptive sights during open-cut construction and at the sites of tunnel portals, reservoirs, and pump stations. Where alternatives pass through residential areas, the perceived effects will be greater than through industrial or vacant areas.

The facilities included in the final alternatives are expected to operate very quietly for the duration of their service life. During construction, it is expected that noise and vibration will be generated by vehicles, pile drivers, excavation equipment, compressors, etc. This noise will be limited to the active working area which will move along the route of construction in the case of in-street facilities. Noise impacts will be more critical where the routes traverse residential areas than where they go through industrial or vacant areas. It is anticipated that construction activities will be limited to no more than 12 hours per day.

Design criteria for all alternatives require that there be no odors emitted during operation of the facilities. Thus, the only long-term odor impact would be the reduction of existing odors along South Basin Canal by eliminating existing stormwater overflows under some alternatives. During construction, localized odors may be emitted where there is excavation in bay mud. Dust and exhaust fumes will be emitted from construction equipment.

Public acceptability for Alternative 2A will probably focus on criticism for locating a pump station and reservoir across the street from a housing project. Public acceptability of Alternatives 3B and 3B-1 will probably focus on reaction to the tunnel located under private property. Concentrated truck traffic at tunnel portals during construction is likely to be unpopular.

Table 3-23 Potential Construction Impacts on Community Services and Attitudes of Sunnydale-Yosemite Alternatives

Item	Alternatives					
	IC-1	2A	2A-1	2A-2	3B	3B-1
Residential access	Residence on Barneveld/Girard/ San Bruno/Tunnel and on Ingalls.	Approximately 30 residences on Ingalls.	Approximately 30 residences on Ingalls and scattered residences on Thomas.	Approximtely 65 residences on Fitzgerald, Jennings, and Underwood.	Approximately 65 residences on Fitzgerald, Jennings, and Underwood.	Approximately 35 residences on Jennings.
Health and social services	Impaired access to District 3 Health Care Center.	-	-	Noise and vibration disruption to Southeast Health Center.	Noise and vibration disruption to Southeast Health Center.	Noise and vibration disruption to Southeast Health Center.
Recreation	Little Hollywood Playground.	Little Hollywood Playground.	Little Hollywod Playground.	Little Hollywood Playground and Bayview Playground.	Bay View Playground, Gilman Playground, Candlestick Park Recreation Area, and Lee Recreation Center.	Little Hollywood Playground, Bay View Playground, and Lee Recreation Center.
School and daycare facilities	Northridge Nursery School and Kindergarten.	Northridge Nursery School and Kindergarten.	Northridge Nursery School and Kindergarten.	Northridge Nursery School and Kindergarten.	Bret Hart Elementary School, Burnett Elementary and Nursery School, Bay Area Childrens School.	Burnett Elementary School, Bay Area Children's Facility.
Community organizations	-	-	-	-	Bay View Property Managers Association.	Bay View Property Managers Association.
Cultural facilities	-	-	-	-	Bay View Opera House.	Bay View Opera House.
Community cohesion	Approximately 2,000 to 8,000 residents; linkage to business, shopping, health center, etc.	Approximately 150 residents' linkage to schools, business, shopping, etc.	130 to 170 residents' linkage to community.	Approximately 200 to 300 residents' linkage to school, playground, shopping, etc.	200 to 300 residents' linkage to community and Candlestick Park.	Approximately 160 residents' linkage to community.

HUNTERS POINT TRANSPORT/STORAGE FACILITY

The Hunters Point Transport/Storage Facility is required to reduce combined sewer overflows through a combination of storage of wet weather flow peaks and conveyance of wet weather flow to the Islais Creek Transport/Storage Facility. The relationship between the Hunters Point Facility and the other Bayside Facilities is shown schematically on Figure 3-1. Sufficient transport and storage capacity must be provided to reduce the overflows from the approximate present level of 46 per year to an annual average of 1 per year.

Existing Facilities

The Hunters Point drainage basin, referred to as the Evans-Hudson drainage basin in some reports, is adjacent to, but topographically separated from, the Yosemite drainage basin. At present, dry weather flow from the Yosemite drainage basin is conveyed through the Hunters Point drainage basin via the existing Hunters Point tunnel. Flow from the two basins is combined near the north portal of the tunnel and transported to the Southeast WPCP for treatment. The existing Hunters Point sewer system does not convey the amount of wet weather flow necessary to meet overflow requirements of the NPDES permits.

Figure 3-24 shows the Hunters Point drainage boundaries, major existing interceptor sewers and overflow points, and the location of the existing Hunters Point Pump Station. The existing combined sewer area in the Hunters Point drainage basin is 386 acres, of which 310 acres are tributary to the sewer system that includes the Evans Avenue Outfall. The remaining 76 acres are tributary to the Hunters Point Pump Station; this system has outfalls located at Hudson Avenue and Griffith Street. The Hunters Point Pump Station has two pumps of nominal 1 mgd capacity which pump dry weather flow through a 10-inch force main. The 10-inch-diameter force main discharges into a 10-inch gravity sewer that increases to a 12-inch sewer. At Keith Street, the flow enters a 21-inch sewer and is conveyed to the Southeast WPCP for treatment. During wet weather, both pumps operate at full speed and together deliver a constant 2.2 mgd. Both the structure and pumps are in good condition.

No Project Alternative

State guidelines for planning wastewater facilities requires the consideration of a no-project alternative, i.e., a case where no action is taken, and the existing facilities are simply retained. The no project alternative will not reduce storm-related overflows below their present average annual frequency of 46 times per year. Therefore, NPDES permit requirements calling for a reduction of overflows to one per year will be violated.

Required Facilities

There are many potential alternatives for providing the required wet weather storage and transport capacities. Transport can be through tunnels, pump stations and force mains, open-cut gravity sewers, or combinations of the three. Storage can be provided in off-street reservoirs or in oversized transport facilities located under City streets.

There are a number of transport rate and storage volume combinations which could accomplish the objective of reducing overflows to one per year. The City's SFMAC computer model was used to determine the required storage volume for various withdrawal rates (transport rates out of the basin). The resulting trade-off curve, shown on Figure 3-25, presents combinations of withdrawal and storage which can be used to attain one overflow per year.

Transport/Storage Planning Criteria

In developing the Hunters Point alternatives, the same planning criteria were considered that were used for the Sunnydale-Yosemite alternatives. Based on these criteria, alternatives were developed so as to minimize monetary costs.

Development and Screening of Initial Alternatives

Based on the facility requirements and planning criteria, four initial alternatives were developed and screened by evaluating their monetary and nonmonetary costs. The initial planning effort is described in the Bayside Facilities Plan, Interim Report (Reference 6). Due to the limited number of initial alternatives, all were retained for further analysis as final alternatives.

Evans Avenue Interceptor Modifications

The Evans Avenue Outfall will be retained as an overflow point to ensure that downstream facilities tributary to the Islais Creek Southside Outfalls Consolidation meet the City's standard of providing capacity for the 5-year flow. It would cost an additional $3 million to reinforce the existing sewer system to transport the 5-year storm flow to the Islais Creek Southside Outfalls Consolidation. The modifications described below, which are independent of the Hunters Point alternatives, must be provided to reduce overflows at the Evans Avenue Outfall to an average of one per year.

The Evans Avenue Interceptor system collects dry and wet weather flows from a tributary area of 310 acres. The dry weather flow is transported through the Evans Avenue Interceptor to a drop manhole at the intersection of Evans Avenue and Keith Street from where it is conveyed in a 21-inch sewer in Keith Street to the north portal of the Hunters Point tunnel. From there, the flow is transported to the Southeast WPCP. A dam in the drop manhole prevents the dry weather flow from continuing southeast to the Evans Avenue overflow. During storms, the wet weather flow overtops the dam and continues on to the overflow structure.

Sewer improvements made for the India Basin Industrial Park area in 1978 included construction of the 66-inch Mendell Street Interceptor, which in turn transports wet weather flows to the Islais Creek Southside Outfall Consolidation structure. A hydraulic analysis using the SFSWMM computer program was performed to determine the adequacy of the Mendell Street Interceptor to carry wet weather flows that would reduce overflows at the Evans Avenue Outfall to an average of one per year. This analysis indicated the need for transport capacity in addition to capacity provided by the Mendell Street Interceptor. Three proposed modifications to the Evans Avenue Interceptor will allow excess wet weather flow to be intercepted and conveyed to the Islais Creek area.

The first modification is a proposed connection between the existing Evans Avenue and Mendell Street Interceptors at the intersection of Evans Avenue and Lane Street as shown on Figure 3-26. The Mendell Street Interceptor will be the primary wet weather transport facility for the area tributary to the Evans Avenue Outfall. A low-level weir will be installed in the connection to ensure that the dry weather flow continues on in the Evans Avenue Interceptor. Wet weather flow that overtops the weir will be conveyed by the Mendell Street Interceptor to the Islais Creek Southside Outfalls Consolidation.

The second modification is to provide additional wet weather transport capacity by making a connection between the Evans Avenue Interceptor and the proposed 90-inch sewer to be constructed as a part of the Sunnydale-Yosemite Facilities between the northern portal of the Hunters Point tunnel and the Islais Creek Southside Outfalls Consolidation. This connection can be made at the point on Fairfax Avenue where the existing Evans Avenue Interceptor passes above the new 90-inch sewer. This connection will be equipped with a weir designed to divert excess wet weather flow to the new 90-inch sewer after the Mendell Street Interceptor reaches capacity. Dry weather flow will remain in the Evans Avenue Interceptor. If Sunnydale-Yosemite Alternative 3B or 3B-1 is selected for implementation, a relief sewer would have to be constructed along Galvez Avenue and Third Street to connect to the Islais Creek Southside Consolidation structure at Custer Avenue. Prior City planning has provided for a future 72-inch sewer on Third Street at an estimated cost of $500,000. Either the 72-inch sewer or the 90-inch sewer, in combination with the Mendell Street Interceptor and Evans Avenue Outfall, will provide sufficient capacity to convey the 5-year storm flow to a point of treatment or overflow. The Evans Avenue Outfall will remain in service as an overflow point for wet weather flows generated by storms with a recurrence interval greater than 1 year.

The third modification to the Evans Avenue Interceptor involves construction of a high level weir structure along Evans Avenue just southeast of the drop manhole at the Keith Street intersection. This weir would contain wet weather flows from storms with less than a 1-year recurrence interval in the Evans Avenue Interceptor upstream of Keith Street and force these flows over the low level weir into the Mendell Street Interceptor and over the weir at the Fairfax Avenue connection. The new weir structure at Keith Street will permit excessively heavy wet weather flows from the Evans Avenue Interceptor to pass on to the existing Evans Avenue Outfall. Overflows from the Evans Avenue Outfall would average less than one per year since all the flow from a 1-year storm would be diverted to the Islais Creek Southside Outfalls Consolidation through the Mendell Street and Fairfax Avenue connections.

Routing of storm flows must include consideration of the 160-mgd, 5-year storm flow for the Evans Avenue Interceptor tributary area. The Evans Avenue Outfall has a maximum capacity of 75 mgd during high tide conditions. Therefore, the Evans Avenue Interceptor relief connections must provide for the remaining 85 mgd that would be transported to the Islais Creek Facilities. The Mendell Street Interceptor will have approximately 35 mgd of available capacity to relieve the Evans Avenue Interceptor during a 5-year storm event. The remaining 50 mgd of relief will be provided by the connection to the 90-inch sewer provided as a part of the Sunnydale-Yosemite Facilities.

An existing wet weather diversion structure is located on Evans Avenue approximately 650 feet south of Keith Street at Middle Point Road. This structure diverts wet weather flows to the Evans Avenue Outfall from approximately 20 acres served by the Middle Point Road sewer. Presently, dry weather flow from the Middle Point Road sewer is carried to the existing 12-inch sewer on Evans Avenue. With the Evans Avenue Interceptor high level weir structure located at Keith Street, construction of a 27-inch wet weather relief sewer from Middle Point Road to Keith Street is required to prevent wet weather overflows to the Evans Avenue Outfall from the Middle Point Road diversion structure.

Consideration was also given to locating the new Evans Avenue Outfall high level weir structure at Middle Point Road rather than at Keith Street. Excavation for the weir structure would be approximately 12 feet deeper at Middle Point Road than at Keith Street. This concept would also require reversing the slope in the existing 72-inch Evans Avenue Interceptor between Keith Street and Middle Point Road to carry dry weather flows north to Keith Street. Reversing the slope could be accomplished by the installation of epoxy grout in the sewer invert. Construction of a high weir at the Middle Point Road intersection, however, would reduce the capacity of the Evans Avenue Outfall so that it could not relieve a 5-year storm flow. Based on a cost and functional evaluation, construction of the 27-inch relief sewer was selected to prevent overflows from Middle Point Road sewer to the Evans Avenue Outfall. The 27-inch relief sewer would be capable of carrying the 5-year storm flow of 23 mgd from the respective tributary area.

All of the modifications associated with the Evans Avenue Interceptor are included in all of the Hunters Point alternatives with the exception of Alternatives 16C-1 and 16E-1. Under these two alternatives, the 27-inch sewer from the existing Middle Point Road diversion structure will not be necessary because these alternatives include a new gravity interceptor in Evans Avenue which is sized to accommodate wet weather flows from the Middle Point Road tributary area. The costs of the Evans Avenue Interceptor modifications are included in the cost estimates for the Hunters Point alternatives.

Detailed Analysis of Final Alternatives

Due to retaining the Evans Avenue Outfall as a functional part of the wet weather system, modifications were required to the initial alternatives previously developed. In addition, some changes were made in pipeline sizes and routes as more detailed information was developed during analysis of the final alternatives. Therefore, the final alternatives are designated as Alternatives 16A-1, 16B-1, 16C-1, and 16D-1 which correspond to the concepts of initial Alternatives 16A, 16B, 16C, and 16D. Also, a new alternative was identified subsequent to the initial screening phase which was considered worthy of additional detailed analysis. The new alternative, identified as Alternative 16E-1, involves increasing the Hunters Point Pump Station capacity by using submersible pumps in the existing wet well, constructing a new force main, and constructing a new reservoir adjacent to the existing pump station.

Alternative 16A-1. A plan of Alternative 16A-1 is shown on Figure 3-27, and a profile is shown on Figure 3-28. In addition to the Evans Avenue Interceptor modifications, this alternative would include modifications to the existing Griffith Street North and Hudson Avenue outfall diversion structures, a 36-inch gravity sewer, an underground storage reservoir, and a new wet weather pump in the existing Hunters Point Pump Station. Storage for the Hunters Point Pump Station tributary area requires a reservoir site in the vicinity of the Hudson Street and Griffith Street North outfalls. The best available reservoir site is the undeveloped portion of the Hudson Avenue right-of-way adjacent to the existing Hunters Point Pump Station. Wet weather flow from the Griffith Street North Outfall would be transported to the reservoir by a new 700-foot long, 36-inch-diameter gravity sewer. The Griffith Street North Outfall would be plugged and abandoned. The estimated 5-year storm flow tributary to the Griffith Street North Outfall is 18 mgd. Dry weather flow from each outfall diversion structure would be conveyed in the present manner through the existing dry weather system and Hunters Point Pump Station to the Southeast WPCP.

The maximum capacity of the existing Hunters Point Pump Station is 2.2 mgd. A withdrawal rate of 2.2 mgd requires a 1.2-million-gallon reservoir. Reliable pumping capacity for the transport rate of 2.2 mgd would be provided by adding a third 1.1-mgd pump to the Hunters Point Pump Station. With the addition of this pump, two backup pumps would be available during dry weather and one backup pump during wet weather. The backup pump for wet weather flow is required because the pumps would be utilized for both wet weather and dry weather pumping. The existing pump station has provisions for adding a third pump.

Approximately two thirds of the storage reservoir volume must be dewatered by a pumping facility. The pumping facility would include two pumps located in a drywell constructed as part of the reservoir. The dewatering pumping facility would have a capacity of 1.8 mgd and would discharge to the Hunters Point Pump Station wet well.

The reservoir would receive all excess storm flow tributary to to the Hudson Avenue and Griffith Street North outfalls. An overflow connection from the reservoir to the existing Hudson Avenue Outfall would be made to protect the existing pump station and reservoir from flooding. This overflow connection would allow an overflow only when the reservoir is full, which would occur not more than an average of once per year.

Solids and floatable materials can be expected to accumulate in the reservoir. A spray wash system would be installed in the reservoir so that the deposited solid materials can be resuspended and pumped by the dewatering pump to the existing Hunters Point Pump Station. Grit and floatables would be removed at the Hunters Point Pump Station in the present manner. The resuspended solids would be pumped to the Southeast WPCP for treatment and disposal.

<u>Alternative 16B-1</u>. A plan of Alternative 16B-1 is shown on Figure 3-29, and a profile is shown on Figure 3-30. In addition to the Evans Avenue Interceptor modifications, this alternative would include modifications to the existing outfall diversion structures, an in-street transport/storage structure, and a new wet weather pump in the existing Hunters Point Pump Station. The

transport/storage facility would be constructed along Innes Road and Hunters Point Boulevard between the existing Griffith Street North Outfall diversion structure and the Hunters Point Pump Station. Modification to the existing Griffith Street North Outfall Diversion structure would provide a connection to the new transport/storage structure, and the Griffith Street North Outfall would be plugged and abandoned. The Hudson Avenue Outfall flow would be conveyed to the transport/storage structure by a gravity connection. Overflow from the tranport/storage facility would occur through the existing Hudson Avenue Outfall when the transport/storage facility is full. Dry weather flow would be conveyed in the present manner through the existing dry weather system and the Hunters Point Pump Station to the Southeast WPCP.

The required capacity of the transport/storage structure is based upon the capacity of the existing Hunters Point Pump Station. A 2.2-mgd withdrawal rate requires 1.2 million gallons in storage. The lower two thirds of the transport/storage structure must be dewatered by a pumping facility. The dewatering pump station would be constructed as part of the transport/storage facility and would consist of a dry well with two pumps. Access to the dewatering pump station would be through a 100-foot-long, 9-foot-diameter tunnel from the existing Hunters Point Pump Station. The dewatering pump station would have a capacity of 1.8 mgd and will discharge to the existing Hunters Point Pump Sation wet well.

The transport/storage structure would be flushed and cleaned in a fashion similar to the storage reservoir in Alternative 16A-1. A spray wash system would resuspend deposited solids and the dewatering pumps would convey them to the Hunters Point Pump Station. The solids would then be transported to the Southeast WPCP for treatment and disposal.

Alternative 16C-1. A plan of Alternative 16C-1 is shown on Figure 3-31, and a profile is shown on Figure 3-32. Alternative 16C-1 would provide gravity sewers sized to transport wet weather flow to the modified Evans Avenue Interceptor. This alternative would include modifications to the existing outfall diversion structures and construction of 30-inch, 39-inch, 27-inch, and 48-inch sewers. The Griffith Street North Outfall diversion structure would be modified to send wet weather flow to a new 30-inch-diameter gravity sewer that is capable of transporting the 5-year storm flow of 18 mgd tributary to the Griffith Street North Outfall. The Griffith Street North Outfall would be plugged and abandoned. Flow would be conveyed to the Hudson Street Outfall diversion structure which would be modified to combine the flow with the 1-year storm flow tributary to the Hudson Avenue Outfall. The combined flows would be transported by a new 39-inch interceptor. Approximately 400 feet of this interceptor would be installed by open-cut construction in Hunters Point Boulevard with average and maximum excavation depths of 30 and 40 feet, respectively. North of this stretch, the interceptor would extend east into the PGandE power transmission line right-of-way. The terrain is lower in the right-of-way so the excavation depth would be less. At the intersection of Middle Point Road and Evans Avenue, wet weather flow from the existing Middle Point Road diversion structure would be added through a new 27-inch sewer. North of this point, the interceptor would increase to 48 inches in diameter, and the combined flows would be conveyed north to the Evans Avenue Interceptor at Keith Street.

Dry weather flow would be conveyed by the existing Hunters Point Pump Station, 10-inch force main and 12-inch gravity sewer to Keith Street. Dry weather flow cannot be carried by the new wet weather gravity interceptors because the average daily dry weather flow will not sustain self-cleaning velocities in the interceptors. Therefore, the existing Hunters Point Pump Station system would be retained under this alternative.

Alternative 16D-1. A plan for Alternative 16D-1 is shown on Figure 3-33, and a profile is shown on Figure 3-34. Alternative 16D-1 would provide a tunnel connection from the vicinity of the existing Hunters Point Pump Station to the existing Hunters Point tunnel for the transport of flow to the Islais Creek area. This alternative would include a new outfall diversion structure; 8-inch, 27-inch, and 36-inch-diameter gravity sewers; and an 850-foot long, 6-foot by 7.5-foot lined tunnel. The new tunnel would convey both dry and wet weather flows to the existing Hunters Point tunnel from the Hudson Avenue and Griffith North Outfalls. The existing Hunters Point Pump Station would be abandoned.

The diameter of the new tunnel is dictated by construction methods rather than hydraulic considerations. Wet weather flow to the tunnel would be restricted to a maxiumum of 30 mgd. Since this flow would utilize a portion of the capacity of the Hunters Point tunnel, storage in the Yosemite area would have to be increased. The existing Griffith Street North and Hudson Street Outfalls would be retained and would overflow on the average once per year. The 5-year storm flow tributary to the Griffith Street North Outfall could be routed to the Hudson Avenue Outfall for approximately $100,000 in additional construction cost, in which case, the Griffith Street North Outfall could be abandoned.

The average dry weather flow for the Hunters Point Pump Station is 0.33 mgd. In order to insure self-cleaning velocities for dry weather flow conditions and also allow adequate flow capacity for wet weather flow conditions, separate dry and wet weather transport facilities would be required. Dry weather flow from the Griffith Street North Outfall diversion structure would be carried by an existing 8-inch sewer to the Hunters Point Pump Station where it would be connected to a new 8-inch sewer constructed from the new Hudson Avenue Outfall diversion structure to the tunnel portal on

Hawes Street. Dry weather flow would be conveyed through a cunette formed in the bottom of the new tunnel and would continue on to the Southeast WPCP.

Wet weather flow from each outfall diversion structure would be transported to the east portal of the new tunnel. The Hudson Avenue wet weather flow would be carried by a new 36-inch-diameter sewer between the new Hudson Avenue diversion structure and the east portal of the new tunnel. The Griffith Street North wet weather flow would be intercepted by a new 27-inch-diameter sewer constructed along Innes Avenue between the Griffith Street North Outfall diversion structure and east portal of the new tunnel. The combined 1-year flow of 30 mgd from both outfalls would be transported through the new tunnel. Flow velocities in the transport facilities would be between 4 and 6 feet per second which would minimize solids deposition and handling problems.

Alternative 16E-1. A plan of Alternative 16E-1 is shown on Figure 3-35, and a profile is shown on Figure 3-36. Alternative 16E-1 would include modifications to the existing outfall diversion structures; a covered reservoir; expansion of the existing Hunters Point Pump Station; a 22-inch force main; and 36-inch, 24-inch, and 39-inch sewers. The concept of this alternative is to maximize the wet weather transport rate by modifying the existing Hunters Point Pump Station in order to minimize the required volume of storage. The increase in wet weather transport capacity would be provided by three new submersible sewage pumps installed within the existing Hunters Point Pump Station wet well. Each pump would deliver 3.13 mgd for a total transport rate of 9.4 mgd. The existing dry weather pumps provide an additional 1.1 mgd for a total basin withdrawal rate of 10.5 mgd. The new pumps would require a new 460-volt service to supplement the existing 240-volt service. The pump station structure would be modified by the addition of a superstructure on the existing roof to house a monorail hoist for removing the submersible pumps. Additional electrical service controls and switchgear and hatches in the existing wet well top slab would also be added.

A new 0.25-million-gallon covered reservoir would be located on the undeveloped portion of Hudson Avenue adjacent to the Hunters Point Pump Station. The reservoir would drain to the existing pump station through a 30-inch gravity connection. Due to limitations of the existing wet well and sewer invert elevations, the reservoir would be limited to a maximum storage depth of 5 feet.

Wet weather flow from the Hudson Avenue and Griffith Street North outfalls would be intercepted by new gravity sewers. The Griffith Street North Outfall would be plugged and abandoned. The wet weather flow would be transported by a new 36-inch gravity sewer from the Griffith Street North Outfall diversion structure to the Hudson Avenue Outfall diversion structure. The estimated flow from the Griffith Street North Outfall from a 5-year storm is 18 mgd. A new 48-inch gravity sewer would carry the combined peak flow of 53 mgd from the Hudson Avenue Outfall diversion structure to the new storage reservoir.

A new wet weather force main and gravity interceptor would convey the additional 9.4-mgd flow from the new wet weather pumps. The wet weather pumps would discharge through a 22-inch force main to a 24-inch gravity sewer along Hunters Point Boulevard and Evans Avenue. The new 24-inch sewer would combine flows with the 27-inch sewer from the existing Middle Point Road diversion structure. The combined flow of 33.5 mgd would be transported along Evans Avenue between Middle Point Road and Keith Streets through a new 39-inch sewer that would discharge into the Evans Avenue Interceptor facilities at Keith Street.

The reservoir would receive all excess storm flow tributary to the Hudson Avenue and Griffith Street North outfalls. A storm overflow connection from the reservoir to the existing Hudson Avenue Outfall would be made to protect the existing pump station and reservoir from flooding. This overflow connection would allow an overflow only when the reservoir is full.

Solids and floatable materials can be expected to accumulate in the reservoir. A spray wash system would be installed in the reservoir so that the deposited solid materials can be resuspended and pumped by the dewatering pump to the existing Hunters Point Pump Station. Grit and floatables would be removed at the Hunters Point Pump Station in the present manner. The resuspended solids would be pumped to the Southeast WPCP for treatment and disposal.

Cost Estimates. The cost estimates at ENR 3800 for the final alternatives are presented in Tables 3-24 through 3-28. Total present worth costs and equivalent annual costs are also shown. The methods used in developing these cost estimates are explained in Chapter 1 of this report.

Construction Employment. The amounts of direct construction labor and secondary employment that would be generated by implementing the Hunters Point alternatives are presented in Table 3-29. Secondary employment is that required to support the construction such as providing the basic construction materials (cement, pipe, etc.) or manufacturing pumps and other equipment items. Secondary employment required to support the construction activities varies from 30 worker-years for Alternative 16C-1 to 60 worker-years for Alternative 16B-1.

Solids Transport. Solids transport considerations for large transport/storage elements of the Hunters Point alternatives are similar to those described for the Sunnydale-Yosemite Facility.

Table 3-24 Estimated Cost of Hunters Point Transport/Storage Facility, Alternative 16A-1

Cost item	Cost, million dollars
Stage III (and II)	
Structural	2.68
Mechanical and electrical	0.68
Site preparation	0.0
Total construction	3.36
Land	0.0
Total capital	4.46
Annual energy	0.004
Annual labor and materials	0.046
Total annual O&M	0.051
Capital less salvage value	4.19
Present worth of O&M	0.39
Total present worth	4.58
Equivalent annual total cost	0.437

Table 3-25 Estimated Cost of Hunters Point Transport/Storage Facility, Alternative 16B-1

Cost item	Cost, million dollars
Stage III (and II)	
Structural	2.55
Mechanical and electrical	0.93
Site preparation	0.0
Total construction	3.48
Land	0.0
Total capital	4.62
Annual energy	0.004
Annual labor and materials	0.044
Total annual O&M	0.048
Capital less salvage value	4.36
Present worth of O&M	0.38
Total present worth	4.74
Equivalent annual total cost	0.451

Table 3-26 Estimated Cost of Hunters Point Transport/Storage Facility, Alternative 16C-1

Cost item	Cost, million dollars
Stage III (and II)	
Structural	2.56
Mechanical and electrical	0.0
Site preparation	0.0
Total construction	2.56
Land	0.050
Total capital	3.45
Annual energy	0.003
Annual labor and materials	0.030
Total annual O&M	0.033
Capital less salvage value	3.17
Present worth of O&M	0.26
Total present worth	3.43
Equivalent annual total cost	0.327

Table 3-27 Estimated Cost of Hunters Point Transport/Storage Facility, Alternative 16D-1

Cost item	Cost, million dollars
Stage III (and II)	
Structural	3.03
Mechanical and electrical	0.0
Site preparation	0.0
Total construction	3.03
Land	0.022
Total capital	4.04
Annual energy	0.0
Annual labor and materials	0.01
Total annual O&M	0.01
Capital less salvage value	3.73
Present worth of O&M	0.08
Total present worth	3.81
Equivalent annual total cost	0.363

Table 3-28 Estimated Cost of Hunters Point Transport/Storage Facility, Alternative 16E-1

Cost item	Cost, million dollars
Stage III (and II)	
Structural	2.96
Mechanical and electrical	0.25
Site preparation	0.0
Total construction	3.21
Land	0.0
Total capital	4.26
Annual energy	0.005
Annual labor and materials	0.050
Total annual O&M	0.055
Capital less salvage value	3.96
Present worth of O&M	0.43
Total present worth	4.39
Equivalent annual total cost	0.419

Table 3-29 Construction Employment for Hunters Point Transport/Storage Alternatives

Alternative	Direct construction employment, worker-years	Secondary employment, worker-years
16A-1	20	60
16B-1	20	60
16C-1	20	40
16D-1	20	50
16E-1	20	50

A pipe and nozzle flushing system supplying 30 gpm per foot of length of structure at 150 psig will be required for each in-line transport/storage box structure or reservoir.

Utilization of Scarce Resources. The two significant scarce resources considered in the analysis of the Hunters Point alternatives are land and energy. None of the alternatives will require the taking of private land. The reservoirs associated with Alternatives 16A-1 and 16E-1 are within the public right-of-way of the undeveloped extension of Hudson Avenue. Alternative 16D-1 will require permanent tunnel easements from private landowners; however, construction of the tunnel will not impair the use of the land above the tunnel. All other alternatives will involve construction only in existing public rights-of-way.

Energy requirements for the final alternatives are presented in Table 3-30. Alternatives 16A-1, 16B-1, and 16D-1 involve both dry and wet weather pumping as well as pumping of reservoir washdown water. Alternative 16B-1 uses the most energy because of the added energy required to wash down and flush solids from the long and narrow storage facility. The energy requirement for Alternative 16C-1 is for pumping dry weather flow only. Alternative 16D-1 uses no energy because both wet and dry weather flows are conveyed out of the Hunters Point area by gravity through the proposed tunnel. In addition to the energy required by the Sunnydale-Yosemite Facility, the Bayside Facilities system will include the Crosstown Pump Station which will consume substantial amounts of energy. See the Crosstown Project Report for more information on the Crosstown Pump Station.

Traffic Impacts and Spoils Removal. There will be no long-term significant traffic problems associated with the final alternatives since the facilities are unmanned and traffic will be limited to periodic visits by maintenance personnel. During construction, significant traffic impacts may occur. The Hunters Point facilities are located in a partially developed area of the south eastern quadrant of the City. Areawide circulation is facilitated by Third Street, a six-lane arterial, and Evans Avenue, a four-lane collector extending eastward to Hunters Point Boulevard and Innes Avenue, which serve as the main vehicle access to the Hunters Point Naval Shipyard. All of the final alternatives include construction of facilities in Evans Avenue, Hunters Point Boulevard, or Innes Avenue.

Potential traffic impacts from construction in these streets would include a reduction in traffic capacity and the disruption of access to local businesses and residences. The absence of intensive local industrial activities results in many available on-street parking spaces. Mitigation measures should include maintenance of two-way traffic on Evans Avenue, Hunters Point Boulevard, and Innes Avenue during construction and keeping the length of the open trench to a minimum.

Table 3-30 Energy Requirements for Final Hunters Point Transport/ Storage Alternatives

Alternative	Energy use,[a] thousand kwhr/yr	Residential equivalent[b]
16A-1	64	10
16B-1	69	10
16C-1	40	6
16D-1	0	0
16E-1	63	10

[a]Additional energy will be consumed at the Crosstown Pump Station. See the Crosstown Project Report for the Bayside Facilities Planning Project.

[b]Residential equivalent is the number of Bay Area residences which would consume the same annual energy as the alternative, based on PGandE data showing single-family residential energy use in the Bay Area to be 6,600 kwhr per year without air conditioning.

Alternative 16B-1 presents additional potential traffic impacts. The transport/storage element could disrupt the entire intersection of Innes Avenue and Hunters Point Boulevard. Mitigation measures for Alternative 16B-1 could include diversion of traffic from Hunters Point Boulevard and restricting curb parking used by construction workers at the site.

Spoils are the excess dirt and rock excavated during the construction of the facilities which cannot be replaced as backfill and must be hauled off by truck for disposal elsewhere. For a discussion of spoils disposal, refer to the Bayside Facilities Plan, Spoils Disposal Report (Reference 8). The volumes of loose spoils produced by the final alternatives are presented in Table 3-31. This material will be exported by dump trucks over the local streets to the Army Street interchanges of U.S. 101 and Interstate 280 and on to disposal sites in San Mateo County. Restrictions may be placed on using specific streets for haul routes, and in order to avoid spilling dirt, trucks will not be overloaded. Haul route reommendations specific to the apparent best alternative project are presented in Chapter 5 of this report.

Alternative 16D-1 features a tunnel with a portal at the intersection of Inness Avenue and Hawes Street. All the excavated material from the construction of the tunnel would be removed through this portal since the other end of the tunnel intersects the existing Hunters Point tunnel. This alternative may cause serious traffic distruption near the portal as dump trucks line up to be filled. Construction worker parking would also tend to be concentrated around the portal.

The traffic and access impacts of the Hunters Point alternatives are summarized in Table 3-32. Four areas of impact are shown: (1) construction truck traffic on surface streets, i.e., arterials, collectors, and local streets with the impact expressed as peak truck travel in miles per day on such streets; (2) impact of instreet, open-cut construction on traffic on various types of streets with the impact expressed as days of disruption of arterials (A), collectors (C), and local (L) streets and identification of the existing traffic load conditions on the impacted streets, i.e., light (L), moderate (M), or heavy (H) traffic volume; (3) parking impact of the construction activities, expressed as curb spaces either occupied by the actual construction work or by construction worker vehicles; and (4) impact on commerical, industrial, residential, and other access with the impact expressed as days of disruption. During construction of pipelines and transport/storage facilities, the work area which produces the impacts will move steadily along the project alignment and will produce the impacts at any one location for a relatively brief period.

Table 3-31 Construction Spoils From Hunters Point Transport/Storage Alternatives

Alternative	Loose volume, cu yd
16A-1	22,700
16B-1	30,500
16C-1	15,000
16D-1	14,300
16E-1	16,200

Table 3-32 Traffic and Access Impacts for Hunters Point Transport/Storage Alternatives

Impact	Alternative				
	16A-1	16B-1	16C-1	16D-1	16E-1
Construction truck traffic on surface streets					
Peak volume, truck per day	47	28	17	21	44
Round trip distance, miles	6	6	6	6	6
Peak truck travel, miles per day	282	168	102	126	264
In-street construction traffic impact by street type, days					
Arterial heavy					
Arterial medium					
Arterial light					
Collectors heavy					
Collectors medium					
Collectors light	48	101	87	116	50
Local heavy					
Local medium					
Local light	0	0	0	0	9
Parking impact, curb spaces					
In-street construction	60	60	60	60	60
Off-street construction	30	0	0	47	30
Access impact, days					
Commerical/industrial	36	61	75	35	104
Residential	12	40	12	24	12
Railroad	0	0	0	0	0
Other	0	0	0	0	0

Community Disruption. There will be no significant long-term disruption to the local community from any of the final Hunters Point alternatives since all the facilities will be below ground with the exception of the superstructure of the existing Hunters Point Pump Station. Short-term disruption in varying degrees can be expected during the construction of any of the alternatives. Disruption primarily will consist of traffic impacts previously described. Construction activities under all alternatives might impair access to businesses located around the corner of Hunters Point Boulevard and Innes Avenue. There are a liquor store and a restaurant on the street, while a body shop and a small shipbuilder, accessible by driveway, are located down a hill from Hunters Point Boulevard. Construction of the reservoir would probably disrupt those businesses located down the hill under Alternatives 16A-1 and 16E-1. An access road to the PGandE power plant from Hunters Point Boulevard could be impaired if Alternative 16C-1 or 16E-1 were implemented. Access to the recreation and boating activies along the bay front could be impaired during construction of any alternative.

Flexibility. Alternative 16D-1 provides the greatest flexibility because existing storage sites will remain available to construct future storage in the Hunters Point area to reduce overflows should discharge requirements become more stringent. Alternative 16D-1 will function to relieve overflows from the Griffith Street North and Hudson Avenue outfalls regardless of whether or not the modifications to the Evans Avenue Interceptor are constructed.

Alternative 16C-1 provides good flexibility because although the export rate from the basin is limited by the capacity of the gravity sewer, the reservoir and transport/storage sites will still be available should discharge requirements change. However, the effectiveness of Alternative 16C-1 will be minimal until the connection is made between the Evans Avenue Interceptor and the Mendell Street Interceptor.

The flexibility of Alternatives 16A-1 and 16B-1 are similar since each alternative requires the use of a reservoir site. Expansion of the reservoirs would be difficult; however, the reservoir site in the companion alternative could be developed if required. In addition, it would be possible to increase the capacity of the existing Hunters Point Pump Station by constructing a new force main and gravity sewer to reduce overflows from the basin. The effectiveness of Alternatives 16A-1 and 16B-1 in reducing overflows is not contingent on completion of the modifications to the Evans Avenue Interceptor.

Alternative 16E-1 is the least flexible in its ability to adapt to future changes in overflow requirements. Under Alternative 16E-1, the existing Hunters Point Pump Station is increased to its maximum capacity and the Hudson Avenue reservoir site is utilized. Alternative 16E-1 will reduce the number of overflows from the Griffith Street North and the Hudson Avenue outfalls. However, prior to the connection of the Evans Avenue Interceptor to the Mendell Interceptor, implementation of Alternative 16E-1 will result in an increased overflow volume from the Evans Avenue Outfall.

Reliability. Alternative 16D-1 provides the greatest overall reliability since it is a gravity system that is immune from power and equipment failure or operator error. Additionally, this alternative does not require aboveground structures or mechanical equipment and therefore is no more vulnerable to natural disasters, such as an earthquake, than is any other portion of the City's present wastewater collection system.

Alternative 16C-1 is the next most reliable alternative because it utilizes gravity transport for wet weather flow and is immune from power and equipment failure or operator error. Dry weather flow would continue to be pumped at the existing Hunters Point Pump Station, and the dry weather system would have the same degree of reliability as it has at present. Underground transport facilities constructed for Alternative 16C-1 would be no more vulnerable to natural disasters, such as an earthquake, than the City's present wastewater collection system. The existing Hunters Point Pump Station is subject to potential mechanical and structural damage from an earthquake. In the event that the Hunters Point Pump Station was out of service, dry weather flow could be diverted to the wet weather gravity system to prevent overflows to the receiving water. Diversion of dry weather flow to the new gravity wet weather system would result in a deposition of solids and require periodical cleaning of the system.

Alternatives 16A-1 and 16B-1 rely on the existing Hunters Point Pump Station to export all wet weather and dry weather flows. As such, these alternatives are vulnerable to power and mechanical failure or operator error. A standby pump would be provided to increase mechanical reliability. Alternatives 16A-1 and 16B-1 are more vulnerable to natural disasters than Alternatives 16C-1 and 16D-1. Alternatives 16A-1 and 16B-1 rely on aboveground structural and mechanical systems which may be put out of service by natural disaster.

Alternative 16E-1 is the least reliable of all alternatives in that it is heavily dependent on mechanical facilities and has less storage than Alternatives 16A-1 and 16B-1.

All alternatives have been sized to meet the requirement of an average of one overflow per year. However, Alternatives 16C-1 and 16D-1 do not provide for storage of wet weather flows and may overflow during short duration, high intensity storms, whereas facilities with storage may not overflow. Conversely, long duration, medium intensity storms may overflow under Alternatives 16A-1, 16B-1, and 16E-1, where as they may not overflow alternatives with a greater withdrawal rate and less storage.

Implementability. The final Hunters Point alternatives are relatively easy to implement. No land must be acquired under any alternative, although permanent easements for the 39-inch-diameter sewer through PGandE property under Alternative 16C-1 and the tunnel proposed under Alternative 16D-1 would have to be acquired. It is estimated that easements for Alternatives 16C-1 or 16D-1 could be obtained in less than 1 year. Any final alternative can be constructed within the 18-month construction period provided in the City's Master Plan Schedule.

A permit will be required from the Bay Conservation and Development Commission for construction of Alternatives 16A-1, 16B-1, and 16C-1, and possibly for Alternatives 16D-1 and 16E-1 as well. No other permits will be required.

Compatibility With Adjacent Land Use. Except for the facilities constructed in easements under Alternatives 16C-1 and 16D-1, the facilities for all the Hunters Point alternatives would be constructed within the public rights-of-way of City streets or at the existing Hunters Point Pump Station. All facilities would be constructed below ground except for the additions to the Hunters Point Pump Station under Alternative 16E-1. Therefore, none of the alternatives will have a significant impact on existing land use or any future changes in land use in the Hunters Point area.

Bypass Analysis. Alternatives 16A-1, 16B-1, and 16E-1 include storage facilities equipped with an overflow to the Hudson Avenue Outfall. The Griffith Street North Outfall would be plugged and the Hudson Avenue diversion structure would be modified under these alternatives so that overflows could only occur from storage. The storage facilities could not be bypassed, and removal of settleable and floatable solids would be provided within the storage facilities.

Alternatives 16C-1 and 16D-1 utilize wet weather gravity transport systems and do not include storage facilities. Overflow from these alternatives would occur when the maximum withdrawal rate is exceeded. Baffles would be provided at the overflow structures to retain floatable solids; however, no removal of settleable solids would be provided for overflows under these alternatives. Alternatives 16C-1 and 16D-1 do not rely on mechanical systems and would not overflow due to power and mechanical failure or operator error.

Flood Protection Analysis. None of the proposed facilities under any alternative are located in the 100-year floodplain.

Public Acceptability. Public acceptability of the Hunters Point alternatives will likely hinge on the short-term construction impacts of each alternative. The long-term impacts, other than cost, are insignificant since all facilities will be underground in public property with the exception of the Hunters Point Pump Station. However, during construction, there will be temporary visually disruptive sights during in-street construction and at the sites of reservoirs, pump stations, or tunnel portals.

The facilities included in the final alternatives are expected to operate very quietly for the duration of their service life. During construction, it is expected that noise and vibration will be generated by vehicles, pile drivers, excavation equipment, compressors, etc. This noise will be limited to the active working area which will move along the route of construction in the case of in-street facilities. It is anticipated that construction activities will be limited to no more than 12 hours per day.

Design criteria for all alternatives require that no odors shall be emitted during operation of the facilities. During construction, dust and exhaust fumes will be emitted from construction equipment.

CHAPTER 4

SUMMARY COMPARISON OF ALTERNATIVES

This chapter presents a comparison of the Southeast Bayside Project alternatives on the basis of cost, environmental, and socioeconomic factors. The comparison results in a recommendation of the apparent best alternative for the Sunnydale-Yosemite and Hunters Point facilities. Chapter 5 describes the apparent best alternatives in detail.

EVALUATION PROCEDURE

The evaluation procedure used to compare the final alternatives consists of ranking each alternative against a set of evaluation factors. These factors consist of cost, energy consumption, land requirements, traffic impacts, flexibility, reliability, implementability, and public acceptability.

Recommendation of the apparent best alternative based on any one factor may lead to adoption of an unacceptable alternative. For example, the least expensive alternative may be environmentally unacceptable; likewise, the most environmentally sound alternative may be too expensive to implement. Therefore, the importance of each factor must be considered. This procedure involves the comparison of a series of trade-offs between the advantages and disadvantages of each alternative against those of the other alternatives. Thus, the selection of the apparent best alternative project is based on trade-off considerations which places the preferred alternative over those offering less advantages or greater disadvantages in a majority of cases.

NO PROJECT ALTERNATIVE

The no project alternative would entail constructing no new facilities and simply retaining the existing sewer system. Under the no project alternative, the average number of wet weather overflows for the area south of the Ferry Building would remain at the present level of approximately 46 per year, and the National Pollutant Discharge Elimination System (NPDES) permit requirements calling for a reduction of overflows to 1 per year would not be achieved. Violation of permit requirements would probably lead to enforcement action by the Regional Water Quality Control Board which could include a sewer connection ban, which essentially is equivalent to a building ban, and fines up to $10,000 or more per day. In addition, the no-project alternative is totally inconsistent with the City's commitment to improve water quality of San Francisco Bay and the Pacific Ocean as expressed in the Clean Water Program Master Plan. This commitment is evidenced by several votes of the City's electorate, numerous actions by the San Francisco Board of Supervisors, and the very existence of the Clean Water Program. Therefore, the no-project alternative is deemed unacceptable and will not be considered further.

SUNNYDALE-YOSEMITE TRANSPORT/STORAGE FACILITY

Table 4-1 presents the ranking of the Sunnydale-Yosemite alternatives against the evaluation factors.

Cost

A comparison of the monetary costs for the alternatives, based on estimates developed in Chapter 3, is presented in Table 4-2. Federal guidelines require that the comparison be based on present worth or equivalent annual cost. The present worth costs vary from a low of $88.2 million for Alternative 2A to a high of $121.9 million for Alternative 3B.

Energy Consumption

Energy requirements for pumping vary from a low of 0.59 million kilowatt hours (kwhr) per year for Alternative 3B to 1.0 million kwhr per year for Alternative 1C-1. Additional energy will be consumed for pumping at the Crosstown Pump Station; these requirements are considered in the Crosstown Project Report for the Bayside Facilities Planning Project.

Land Requirements

All Sunnydale-Yosemite alternatives, except 3B, require the acquisition of private property. The proposed sites for the alternatives are shown on Figure 3-5. Alternatives 2A-1 and 2A-2 are ranked best under this factor because Sunnydale site S-2 is the only private property that would have to be acquired; Yosemite Site Y-5 is City property. Alternatives 1C-1 and 2A would require the acquisition of Yosemite Site Y-2 as well as Sunnydale Site S-2. Although Alternative 3B would not require the acquisition of private property for a reservoir or pump station site, it would require the acquisition of easements from 106 property owners on 20 blocks in order to construct the tunnel. The need to negotiate agreements with so many property owners is a greater detriment to Alternative 3B than the need to acquire one or two sites is to other alternatives. Alternative 3B-1 would require the acquisition of both Sunnydale Site S-2 and the easements for the tunnel.

Table 4-1 Ranking of Sunnydale-Yosemite Transport/Storage Facility Alternatives

Evaluation factor	Alternatives					
	1C-1	2A	2A-1	2A-2	3B	3B-1
Present worth cost	3	1	2	4	6	5
Energy consumption	5	4	3	3	1	2
Land requirements	2	2	1	1	3	4
Traffic impacts	5	1	2	3	4	1
Flexibility	1	1	1	1	2	2
Reliability	4	3	3	5	2	1
Implementability	3	4	1	1	6	5
Public acceptability	6	3	1	2	5	4

Table 4-2 Estimated Cost Comparison of Sunnydale-Yosemite Transport/Storage Facility Alternatives

Alternative	Contract cost	Land cost	Total capital cost	Annual operation and maintenance cost			Total present worth	Equivalent annual cost	Rank
				Labor materials	Energy	Total			
1C-1	73.5	1.89	104.4	0.267	0.096	0.363	100.1	9.54	3
2A	64.3	2.42	92.1	0.252	0.065	0.317	88.2	8.40	1
2A-1	67.8	2.24	96.8	0.242	0.065	0.307	92.2	8.79	2
2A-2	75.6	2.24	107.7	0.256	0.065	0.321	102.7	9.79	4
3B	93.2	0.14	130.1	0.108	0.03	0.138	121.9	11.6	6
3B-1	79.8	1.87	113.2	0.160	0.03	0.190	106.4	10.1	5

Traffic Impacts

Table 4-3 presents the results of the traffic impacts analysis discussed in Chapter 3 and presented in Table 3-18. The data on in-street construction traffic impact from Table 3-18 are totaled for presentation in Table 4-3. Parking and access impact data are similarly treated. The rankings for each of the four impacts in Table 4-3 are used to determine the traffic impacts rankings of the alternatives. The results reveal that Alternatives 3B-1 and 2A would offer the least traffic impact, while Alternative 1C-1 would create the most serious traffic impacts.

Flexibility

Alternatives 1C-1, 2A, 2A-1, and 2A-2 would be more flexible than Alternatives 3B and 3B-1 because the Sunnydale/Yosemite facilities would still be usable if the major downstream facilities in Islais Creek are not constructed. In addition, the rate of transporting wet weather flows out the Yosemite and Sunnydale basins could be increased by adding more pumping capacity under Alternatives 1C-1, 2A, 2A-1, and 2A-2. This mode of operation, however, would require some downstream construction for relief.

Reliability

Alternatives 3B and 3B-1 would be more reliable than the other alternatives in case of power failure because they rely on gravity flow and do not include pump stations. This assumes that the Crosstown Pump Station will have standby power.

An evaluation of reliability also includes consideration of the bypass and flood protection analyses. Bypassing the Sunnydale facilities would be possible through the existing Sunnydale Interceptor during heavy storms under all alternatives. In the Yosemite area, the existing outfalls are retained under Alternatives 2A-2, 3B, and 3B-1, so bypassing the proposed facilities through these outfalls would be possible during heavy storms. Pump stations and reservoirs at low elevations would be designed for protection against local flooding which could occur during heavy storms, so there would be little difference in flooding hazard among the alternatives.

There would be little difference among the alternatives in the case of a major earthquake since most of the facilities under any alternative would be located below ground and would be relatively safe.

In ranking the alternatives for reliability, preference is given to the gravity flow alternatives (3B and 3B-1) because their relative immunity to power outages is more important than the

Table 4-3 Comparison of Traffic Impacts for Sunnydale-Yosemite Transport/Storage Facility Alternatives

Alternative	Peak truck travel		In-street construction		Parking impact		Access impact	
	Miles/day	Ranking	Days	Ranking	Spaces	Ranking	Days	Ranking
1C-1	766	6	1,002	4	200	5	1,051	4
2A	590	5	570	1	190	3	618	1
2A-1	573	4	753	3	190	3	806	2
2A-2	405	2	1,033	5	150	1	1,225	6
3B	416	3	1,036	6	154	2	1,205	5
3B-1	373	1	736	2	194	4	885	3

potential to bypass the proposed facilities. The nongravity alternatives are ranked on the basis of number of potential bypass locations.

Implementability

Alternatives 2A-1 and 2A-2 would be easier to implement because Sunnydale Site S-2 is the only property that needs to be acquired and permits are required from nine agencies. The other alternatives require permits from ten agencies. Permit requirements are presented in Table 3-20. Alternative 2A requires the acquisition of Yosemite Site Y-2 as well as Site S-2. Alternatives 3B and 3B-1 would be harder to implement because of the need to acquire easements for the tunnel. Alternative 3B would be the hardest to obtain because permission from the City Parks and Recreation Department would be required for the pipeline through the Candlestick Stadium parking lot.

Public Acceptability

Alternative 2A-1 would be the most acceptable alternative to the public. In the Yosemite area, Site Y-5 is utilized for the pump station and reservoir. This site is located north of the proposed CPSRA in an area of industrial buildings and vacant lots. Proper architectural treatment and landscaping would make this facility an attractive visual improvement to the area. Although construction impacts would be significant on Carroll Avenue, Ingalls Street and Thomas Avenue, other alternatives would involve similar levels of disruption on other streets. There would be only minor construction within the CPSRA, and the three existing overflow structures would be eliminated from the South Basin Canal.

Alternative 2A-2 has several characteristics similar to Alternative 2A-1 which would make Alternative 2A-2 acceptable to the public. The Yosemite Site Y-5 north of the CPSRA is utilized for a pump station. Construction impacts on local streets would be more severe because in-line transport/storage facilities are proposed for more streets. The three existing overflow structures would remain within the South Basin Canal after modification.

Alternative 2A has the disadvantage of utilizing Yosemite Site Y-2 for a pump station and reservoir. This site is located across the street from a Redevelopment Agency housing project, and public opposition is expected if this site is proposed for a wastewater facility no matter how well it is architecturally treated or landscaped. Construction impacts on local streets would be significant. Under Alternative 2A, major pipelines would be installed across the South Basin Canal through the CPSRA. Although the three existing overflow structures within the South Basin Canal are eliminated, a new reservoir overflow structure would be provided to discharge to the canal.

Public acceptability of Alternative 3B-1 would be less than favorable because of the tunnel. People would be concerned about having the tunnel located at relatively shallow depths below their homes and businesses even though no danger would exist during construction or operation. Construction impacts at the tunnel portals would be severe because truck traffic would be concentrated at these locations. The public would be concerned about truck traffic along Third Street, a major, busy street. The south portal of the tunnel is located near the Southeast Medical Facility which may result in public opposition. Construction of in-line transport/storage facilities would impact local streets, particularly Jennings Street and Armstrong Avenue. A major pipeline would be constructed across the South Basin Canal within the CPSRA, and two of the existing overflow structures at the canal would be retained.

Like Alternative 3B-1, Alternative 3B also includes the tunnel and, therefore, has the same disadvantages. However, Alternative 3B has more in-line transport/storage elements which would result in greater adverse impacts during construction. Underwood and Thomas Avenues and Gilman and Fetch Streets are the additional streets most affected. Alternative 3B also includes a major pipeline through the parking lot of Candlestick Stadium which would be unpopular if the construction were to interfere with parking on game days.

Alternative 1C-1 would receive the least amount of public support because of the impact of the construction of pipelines through the Visitacion Valley and Portola residential districts. This alternative is the only one that directly impacts these neighborhoods. In addition, Alternative 1C-1 would utilize Site Y-2 across from the housing project. This alternative also includes major pipelines which would cross the South Basin Canal within the CPSRA. The three existing overflows to the canal would be eliminated but a new reservoir overflow structure would be provided to discharge to the canal.

Recommended Apparent Best Alternative

Table 4-1 reveals that Alternative 2A-1 is the recommended apparent best alternative. Although it does not possess the lowest present worth cost, it is only 4 percent more expensive than Alternative 2A, the least costly alternative. However, Alternative 2A-1 is significantly more acceptable to the public than Alternative 2A, principally because the Yosemite reservoir and pump station are located on Site Y-5 away from the housing project. In addition, there is only minor construction of facilities within the CPSRA under Alternative 2A-1.

Alternative 2A-1 is the easiest alternative to implement and is significantly easier to implement than Alternative 2A, principally because only one reservoir site on private property must be acquired and fewer permits are needed. Although Alternative 2A would involve less traffic impacts during construction, the benefits associated with Alternative 2A-1 more than offset the greater short-term adverse traffic impacts and the 4 percent difference in cost over Alternative 2A. The two alternatives are equally ranked in flexibiltiy and reliability, while Alternative 2A-1 is ranked slightly better in energy consumption.

Alternative 1C-1 is significantly less desirable than Alternative 2A-1. Alternative 1C-1 would cost more on a present worth basis, consume more energy, require more private property, and be less reliable. The traffic impacts during construction are the most severe under Alternative 1C-1 because of its impact on the Visitacion Valley and Portola districts in addition to other areas. Alternative 1C-1 is more difficult to implement than Alternative 2A-1 due to the need to acquire two sites from private property owners and more construction within the CPSRA. Alternative 1C-1 is the least acceptable to the public.

Alternative 2A-2 is not selected as the apparent best alternative over Alternative 2A-1 because Alternative 2A-2 would cost more on a present worth basis, would result in greater traffic impacts during construction, and would have lower reliability. Public acceptability for Alternative 2A-2 would be less than Alternative 2A-1 because it involves additional traffic impacts during construction.

Alternative 3B is the least attractive alternative. It is the most expensive alternative on a present worth basis. It possesses significant easement acquisition problems due to the tunnel, and it would cause significant traffic impacts during construction. It would be difficult to implement because it requires the tunnel and the pipeline through the Candlestick Stadium parking lot. The public would be rather unreceptive to this alternative.

Alternative 3B-1 is not an attractive alternative for many of the same reasons as Alternative 3B. Alternative 3B-1 requires acquisition of a reservoir site in the Sunnydale area as well as easements along the tunnel route. It is rated low on implementability and public acceptability.

HUNTERS POINT TRANSPORT/STORAGE FACILITY

Table 4-4 presents the ranking of the Hunters Point alternatives against the evaluation factors.

Cost

A comparison of the monetary costs for the alternatives, based on estimates developed in Chapter 3, is presented in Table 4-5. Federal guidelines require that the comparison be based on present worth or equivalent annual cost. The present worth costs vary from a low of $3.43 million for Alternative 16C-1 to a high of $4.74 million for Alternative 16B-1.

Energy Consumption

Energy requirements for pumping vary from none for Alternative 16D-1 to 69,000 kwhr per year for Alternative 16B-1. Alternative 16C-1 would consume 40,000 kwhr per year, while Alternatives 16E-1 and 16A-1 would consume 63,000 and 64,000 thousand kwhr per year, respectively. Additional energy will be consumed for pumping at the Crosstown Pump Station; these requirements are considered in the Crosstown Project Report for the Bayside Facilities Planning Project.

Land Pequirements

None of the Hunters Point alternatives require the acquisition of private property, although easements must be acquired for the 39-inch-diameter sewer in Alternative 16C-1 and the tunnel in Alternative 16D-1. Otherwise all the facilities in all the alternatives would be constructed in the rights-of-way of public streets. Alternative 16C-1 would require the acquisition of a single easement from PGandE. Alternative 16D-1 would require the acquisition of easements from several property owners in order to construct the tunnel. The need to acquire all these easements is a detriment to Alternative 16D-1.

Traffic Impacts

Table 4-6 presents the results of the traffic impact analysis discussed in Chapter 3 and presented in Table 3-32. The data on in-street construction traffic impact from Table 3-32 are totaled for presentation in Table 4-6. Parking and access impact data are similarly treated. The rankings for each of the four impacts are used to determine the traffic impacts rankings of the alternatives. The results reveal that Alternative 16C-1 would offer the least traffic impacts, while Alternative 16E-1 would create the most serious traffic impacts.

Table 4-4 Ranking of Hunters Point Transport/Storage Facility Alternatives

Evaluation factor	Alternatives				
	16A-1	16B-1	16C-1	16D-1	16E-1
Present worth cost	4	5	1	2	3
Energy consumption	4	5	2	1	3
Land requirements	1	1	3	2	1
Traffic impacts	2	3	1	3	4
Flexibility	3	3	1	2	4
Reliability	3	3	2	1	4
Implementability	1	1	2	3	1
Public acceptability	2	3	1	5	4

Table 4-5 Estimated Cost Comparison of Hunters Point Transport/Storage Facility Alternatives

Alternative	Contract cost	Land cost	Total capital cost	Annual operation and maintenance cost			Total present worth	Equivalent annual cost	Rank
				Labor materials	Energy	Total			
16A-1	3.36	0.0	4.46	0.046	0.004	0.050	4.58	0.437	4
16B-1	3.48	0.0	4.62	0.044	0.004	0.048	4.74	0.451	5
16C-1	2.56	0.050	3.45	0.030	0.003	0.033	3.43	0.327	1
16D-1	3.03	0.022	4.04	0.010	0.0	0.010	3.81	0.363	2
16E-1	3.21	0.0	4.26	0.050	0.005	0.055	4.39	0.419	3

Table 4-6 Comparison of Traffic Impacts for Hunters Point Transport/Storage Facility Alternatives

Alternative	Peak truck travel		In-street construction		Parking impact		Access impact	
	Miles/day	Ranking	Days	Ranking	Spaces	Ranking	Days	Ranking
16A-1	282	5	48	1	90	2	48	1
16B-1	168	3	101	4	60	1	101	4
16C-1	102	1	87	3	60	1	87	3
16D-1	126	2	116	5	107	3	59	2
16E-1	254	4	59	2	90	2	116	5

Flexibility

Alternative 16C-1 would provide the greatest flexibility because the storage sites proposed under other alternatives would still be available for future use in meeting more stringent discharge requirements. Alternative 16D-1 would offer the same advantage; however, Alternative 16D-1 would utilize 25 percent of the capacity of the existing Hunters Point tunnel which would require the construction of additional storage in the Yosemite area. Alternatives 16A-1 and 16B-1 would use one storage site, but the site used in the companion alternative would still be available. Alternative 16E-1 would be the least flexible alternative because it would use one storage site, and it would not permit any future increase in the capacity of the existing Hunters Point Pump Station, which is possible under the other alternatives.

Reliability

Alternative 16D-1 would offer the most reliability because it is a gravity system that is immune to local power failures and equipment malfunction. All alternatives would be affected by a power outage at the Crosstown Pump Station. Alternative 16C-1 would be the next most reliable alternative because gravity flow is provided for wet weather flow; dry weather flow would be pumped as it presently is. Alternatives 16A-1 and 16B-1 would involve pumping both dry and wet weather flows. Alternative 16E-1 would provide the least reliability because both dry and wet weather flows would be pumped, and the small storage reservoir would place greater reliance on pumping.

An evaluation of reliability also includes consideration of the bypass and flood protection analyses. Bypassing the storage facilities under any of the alternatives would be impossible. None of the facilities under any alternative are located within the 100-year floodplain; therefore, they would not be subject to flooding.

Implementability

Alternatives 16A-1, 16B-1, and 16E-1 would be easy to implement because no private land or easements would be required. An easement from Pacific Gas and Electric Company would be required for the gravity sewer adjacent to Hunters Point Boulevard under Alternative 16C-1. Alternative 16D-1 would be the most difficult alternative to implement because it would require easements from the property owners along the tunnel alignment. A permit from the Bay Conservation and Development Commission may be required for any of the alternatives.

Public Acceptability

Short-term construction impacts will influence the public acceptance of the Hunters Point alternatives. There will be no new aboveground facilities with the exception of the expansion to the existing Hunters Point Pump Station under Alternative 16E-1. The evaluation of traffic impacts, previously discussed, includes consideration of peak truck travel along City streets, the days of construction in the streets, and the number of parking places and accesses to houses and businesses which are affected be each alternative. Thus, the evaluation of traffic impacts also provides a measure of the public acceptability of those alternatives that only possess short-term construction impacts. Therefore, Alternatives 16A-1, 16B-1, and 16C-1 are ranked the same under public acceptability as they are for traffic impacts. Alternative 16E-1 would be less acceptable because, in addition to the short-term construction impacts, the alternative features an aboveground expansion of the existing Hunters Point Pump Station. The tunnel would make Alternative 16D-1 the least acceptable because people would be concerned about having a tunnel constructed under their homes even though no danger or nuisance would exist. Construction impacts would be concentrated along the proposed gravity sewers and at the tunnel portal under Alternative 16D-1.

All the alternatives are compatible with adjacent land use because there would be no aboveground facilities with the exception of the pump station expansion under Alternative 16E-1 on a site already used for a wastewater facility.

Recommended Apparent Best Alternative

Table 4-4 reveals that Alternative 16C-1 is the recommended apparent best alternative. It has the lowest present worth cost and is ranked best under land requirements, traffic impacts, flexibility and public acceptability. It ranks well under energy consumption, reliability, and implementability. It is likely that Pacific Gas and Electric Company would grant the easement necessary to construct the gravity sewer in their right-of-way. If so, the only major concern about Alternative 16C-1 is the 20- to 30-foot-deep trenches required for several hundred feet along Hunters Point Boulevard. The deep trenches along Hunters Point Boulevard are not significant enough to recommend against Alternative 16C-1 as the apparent best alternative.

Compared to Alternative 16C-1, Alternative 16A-1 would be 34 percent more expensive on a present worth basis, consume more energy, have greater traffic impacts, and be less flexible, reliable and acceptable to the public. Alternative 16B-1 would be 38 percent more expensive, have significant traffic impacts, and be less flexible, reliable, or acceptable to the public than Alternative 16C-1.

Compared to the recommended apparent best alternative, Alternative 16D-1 would be 11 percent more expensive, have greater traffic impacts, and be less flexible. Because Alternative 16D-1 is a complete gravity system, it would consume no energy and would be more reliable. However, Alternative 16D-1 would require easements from property owners for the tunnel, and therefore, would have greater land requirements and be more difficult to implement. Alternative 16E-1 would be 28 percent more expensive on a present worth basis, consume more energy, have greater traffic impacts, and be less flexible, reliable, and acceptable to the public than the recommended apparent best alternative.

CHAPTER 5

APPARENT BEST ALTERNATIVE PROJECT

The apparent best alternative Southeast Bayside Project consists of a covered reservoir and transport structure in the Sunnydale area; large transport structures, a covered reservoir, and a pump station in the Yosemite area; large sewers downstream of the existing Hunters Point sewer tunnel; and a system of sewers in the Hunters Point area. The apparent best alternative for each element is described in this chapter. All of the Southeast Bayside Project facilities will be constructed in Stage II, and no additional facilities will be required for Stage III of Master Plan implementation.

SUNNYDALE-YOSEMITE TRANSPORT/STORAGE FACILITY

The apparent best alternative for the Sunnydale-Yosemite Transport/Storage Facility is Alternative 2A-1. The features of this alternative are shown on Figures 5-1, 5-2, and 5-3. A profile of Alternative 2A-1 is presented on Figure 5-4. In the following description of the proposed facilities, the wet weather flow system is described first, followed by a description of the dry weather flow system.

Wet Weather Flow System

Pumping rates and facility sizes are based upon initiating maximum withdrawal from Islais Creek storage within 1 hour from the commencement of a storm. In the Sunnydale area, shown on Figure 5-1, the facilities consist of a 10-million-gallon covered reservoir and several transport sewers. The reservoir is located on a site presently owned by the Ceco Corporation and used for storing and fabricating building materials. The reservoir is located near the existing 78-inch-diameter Sunnydale interceptor sewer that transports combined sewer storm flow to the bay.

Under the apparent best alternative, combined sewer storm flow follows its present route down the existing Sunnydale interceptor to the new control structure located at the existing overflow point. In this control structure, a closed gate prevents discharge to the bay, and approximately 20 million gallons per day (mgd) flows into an existing 2-foot 6-inch by 3-foot 9-inch sewer in Harney Way. This sewer is connected by means of a new 36- and 66-inch sewer to the existing Candlestick sewer tunnel. When the capacity of the small sewer is reached, flow backs up in the 78-inch interceptor until it overflows a weir into the new 60-inch sewer on Alana Way. Flow from the existing Blanken Avenue sewer is intercepted east of U.S. 101 and is also transported through the Alana Way sewer. Wet weather flow in the Alana Way sewer combines with flow in the 36-inch line on Harney Way and is conveyed to the Candlestick tunnel through the new 66-inch sewer.

When the capacity of the Candlestick tunnel is reached, flow backs up in the 78-inch interceptor to the control structure at Tunnel Avenue and passes into the covered reservoir through a 10-foot-wide by 10-foot-deep transport structure. The reservoir is sized to retain the combined sewer storm flow resulting from a storm with a 1-year recurrence interval. Storms with larger volumes of flow will fill the reservoir and cause it to overflow. When this occurs, a gate in the Tunnel Avenue control structure closes, diverting all combined sewer storm flow through the reservoir. At the same time, the gate opens in the control structure at the existing overflow location. The overflow from the reservoir returns to the existing 78-inch sewer by means of the new double 8-foot-wide by 6-foot 6-inch-deep box transport structure, flows down the 78-inch sewer, and overflows to the bay. Thus, all overflows to the bay occur from a full storage facility. Details of the inlet and outlet structures for the reservoir are included on Figures 5-5 and 5-6.

Figure 5-2 shows the location of the proposed sewers, transport structures, reservoir, and pump station in the Yosemite area. Combined sewer storm flow from the Yosemite area is conveyed to a 7.5-million-gallon covered reservoir located at a site at Thomas Avenue and Griffith Street which is currently owned by the City. This site is adjacent to, but outside, the boundaries of the proposed Candlestick Point State Recreation Area. At the adjacent pump station, Sunnydale and Yosemite wet weather flows are pumped to the existing Hunters Point sewer tunnel.

Wet weather flow from Fitch Street is intercepted and carried by an 84-inch sewer on Carrol Avenue to combine with wet weather flow from Ingalls Street at the junction box located at the Carrol-Ingalls intersection. A 10-foot-wide by 11-foot-deep box conduit on Ingalls Street conveys wet weather flow north where it intercepts wet weather flow from Bancroft and Yosemite Avenues. After the Yosemite Avenue intersection, the box structure is increased to a 20-foot-wide by 14-foot-deep conduit to accommodate the increased flow. This structure continues to the east on Thomas Avenue to the reservoir site.

Wet weather flow from the Candlestick tunnel is conveyed to the proposed Yosemite Pump Station by a 66-inch conduit followed by a 6-foot-wide by 4-foot-deep box structure as shown on Figure 5-2. Because the hydraulic grade line of the Sunnydale wet weather flow is approximately 8 feet lower than that of the

Yosemite wet weather flow, the compartment carrying the Sunnydale wet weather flow is constructed underneath the box conduit carrying the Yosemite flow. A section depicting the double box structure is shown on Figure 5-4. As the combined sewer storm flow from the Sunnydale basin reaches the pump station, it is immediately pumped to the Hunters Point tunnel through the 66-inch force main. The Yosemite wet weather flow is pumped through the same force main at a variable rate which depends upon the rate of the Sunnydale flow. Sunnydale wet weather flow is always pumped in preference to the Yosemite flow because it cannot flow into storage by gravity. If the Sunnydale flow has not reached the pump station, up to 120 mgd (the capacity of the Hunters Point tunnel) can be pumped from the Yosemite basin. By keeping the wet weather from the two basins separated, and preferentially pumping the Sunnydale wet weather flow, the Yosemite wet weather flow can be stored to a much higher elevation.

The Hunters Point tunnel is slightly surcharged in order to provide gravity transport for the Sunnydale and Yosemite wet weather flow into the Islais Creek area. As a result, a new gate on the existing gravity sewer at the upstream tunnel portal closes when the wet weather pumps begin to operate to avoid flooding in the area of Shafter Avenue and Griffith Street. When the gate closes, flow in the existing line backs up and is diverted to the Yosemite Pump Station. Yosemite wet weather flow in excess of that being pumped through the Hunters Point tunnel flows into the covered reservoir. The reservoir is sized to retain the flow from a storm with a 1-year recurrence interval without causing an overflow to the bay. Storms with volumes of flow greater than the 1-year event will fill the reservoir and overflow into the bay through a new double 10-foot-wide by 9-foot-deep overflow structure on Shafter Avenue extended. However, the new overflow structure will be constructed only if experience proves that the three existing overflows are incapable of serving as overflows for the reservoir.

The facilities in the Evans Avenue area are shown on Figure 5-3. A control structure located at the downstream end of the Hunters Point tunnel separates the flow into two streams. The existing 48-inch-diameter sewer conveys 10 mgd to the Southeast Water Pollution Control Plant (WPCP). The remaining 110 mgd flows through a new 78-inch pipeline on Fairfax Avenue. At the intersection of Fairfax Avenue and Mendell Streets, additional wet weather flow from an existing interceptor in Newhall Street is added at a junction box, and the sewer diameter is increased to 90 inches. The flow is transported to the Islais Creek South Side Outfalls Consolidation through the 90-inch pipeline along Fairfax Avenue, Newhall Street, Evans Avenue, Third Street, and Custer Avenue. To avoid existing facilities, the 90-inch pipeline drops 6.6 feet before entering the Islais Creek South Side Outfalls Consolidation as shown on Figure 5-4. A sloping concrete fill section will be installed to raise the invert of the Islais Creek South Side Outfalls Consolidation approximately 4 feet in order to match the invert of the proposed transport/storage facilities at the intersection of Davidson Avenue and Selby Street. Combined sewer storm flow is transported to the Crosstown Pump Station by means of the Islais Creek Transport/Storage Facility described in the Crosstown Project Report.

Dry Weather Flow System

Dry weather flow in the Sunnydale area bypasses the Sunnydale Reservoir and follows its existing route through the Candlestick tunnel and into the Yosemite basin. The 4-foot by 6-foot box structure in Ingalls Street will have a rounded bottom to accommodate dry weather flow as shown on Figure 5-4. The Sunnydale dry weather flow and the Yosemite dry weather flow from the existing Ingalls Street sewer and the new Carroll Avenue sewer are intercepted and carried in the 4-foot by 6-foot box to the Yosemite Pump Station. Dry weather flow is lifted at the Yosemite Pump Station through a new 20-inch force main to a weir at Shafter Avenue and Griffith Street and then flows by gravity through the Hunters Point tunnel to the Southeast WPCP. The major portion of the Yosemite dry weather flow follows its present gravity route through the Shafter Street sewer to the Hunters Point tunnel and the Southeast WPCP. The remainder of the Yosemite dry weather flow goes to the new Yosemite Pump Station where it is pumped to the Hunters Point Tunnel.

Sunnydale and Yosemite Reservoirs

The Sunnydale and Yosemite covered reservoirs are conceptually similar. Both involve basins in series which retain peak flow rates. Dewatering, cleaning, odor control, and ventilation facilities are provided for both reservoirs.

Sunnydale Reservoir. The Sunnydale Reservoir site is located at the intersection of Tunnel and Visitacion Avenues. Visitacion Avenue is not used as a public street but serves as a driveway into the Ceco Corporation property. Figure 5-5 shows a site plan and cross sections of the reservoir. As indicated, the top of the Sunnydale Reservoir is level with the ground elevation. The odor control and ventilation building and the dewatering pump station superstructure are aboveground.

Figure 5-6 shows a detailed plan and cross sections of the Sunnydale Reservoir. Combined sewer storm flow enters through the influent box structure directly to the first basin. Basin 1 overflows into basin 2 over a weir between the two basins. The basins continue to fill until the inflow ceases or until the water surface reaches the overflow weir elevation. If flow is greater than the 1-year event, settled combined sewer storm flow will pass over a weir into the overflow channel, through the double box overflow structure, and into the existing Sunnydale Interceptor.

After a storm event, the top 6 feet of reservoir depth is dewatered first by gravity. Below this depth, variable-speed pumps are used to lift flow at a rate of 60 mgd into the double box overflow structure.

Sunnydale Reservoir flush water is stored in the flush water channel as indicated on Figure 5-6. Following a storm, flush water is released into the storage basins by gates and flows into the drainage channel where it is lifted to the overflow structure by the dewatering pumps. Flush water containing resuspended solids flows by gravity to the proposed Yosemite Pump Station through the dry weather flow route. Requirements of the flushing system are discussed in a subsequent section on solids transport.

The odor control and ventilation building shown on Figure 5-6 houses activated carbon units and ventilation fans. The details of the odor control and ventilation units are discussed in a subsequent section on odor control.

Figure 5-7 is an architectural sketch of the Sunnydale Reservoir site. The reservoir could be lined with trees and covered with a thin layer of soil for a lawn or ground cover. This type of landscaping would lessen the visual impact on the residential area which overlooks the site. Reinforcing the roof for light industrial use is also feasible for this site. The dewatering pump station and the odor control and ventilation building are relatively small structures and will be handled in such a way as to be visually compatible with the surrounding area.

Yosemite Reservoir. The Yosemite Reservoir is located between Griffith and Fitch Streets and Shafter and Underwood Avenues. The reservoir site is the combination of block 4805 and the major portion of block 4794. The northwestern corner of block 4794 is privately owned and presently used for light manufacturing. Figure 5-8 shows a site plan and sections of the reservoir. As indicated, the roof of the Yosemite Reservoir is slightly above the ground elevation. The odor control and ventilation building and pump station are aboveground structures.

Figure 5-9 shows a detailed plan and cross sections of the Yosemite Reservoir. As previously mentioned, combined sewer storm flow that exceeds the pumping rate through Hunters Point tunnel flows into the reservoir. Yosemite wet weather flow enters the reservoir through the inlet channel which steeply slopes into the first basin. The basins are interconnected by weirs, which provide flow in the direction indicated on Figure 5-9. The basins fill until the inflow ceases or until the water surface reaches the overflow weir elevation. If flow is greater than the 1-year event, settled combined sewer storm flow will pass over a baffled weir into the overflow channel and through the overflow structure on Shafter Street.

There are two wet wells in the Yosemite Pump Station, one for the Yosemite basin wet weather flow, and one for the Sunnydale basin wet weather flow. Two 30-mgd wet weather pumps provide a capacity 60 mgd for the Sunnydale wet well. There are three 40-mgd pumps providing a total of 120-mgd pumping capacity for the Yosemite wet well. Peak wet weather flow pumping is limited to 120 mgd, which may be pumped entirely from the Yosemite sump or as a combination of flow from both the Sunnydale and the Yosemite wet wells. Sunnydale wet weather flow is pumped in preference to the Yosemite wet weather flow.

The dry weather pumps do not operate during storm events. As combined sewer storm flow ceases, the Yosemite wet weather pumps draw flow from the reservoir until it is completely dewatered. The rate of dewatering for the Yosemite Reservoir is dependent upon the rate of Sunnydale flow being pumped through the Hunters Point tunnel and varies between 60 and 120 mgd.

The Yosemite Reservoir washdown system is similar to that of the Sunnydale Reservoir. Following a storm, the walls of the reservoir are washed using fixed spray nozzles, and cleaning water flushes the bottom of the storage basins. Flush water and resuspended solids flow into the drainage channel, are pumped by dry weather pumps to the Hunters Point tunnel, and flow to the Southeast WPCP.

Ventilation fans are located within the odor control and ventilation building shown on Figure 5-9. Details of the units are discussed in a subsequent section on odor control.

As Figure 5-10 suggests, the reservoir and pump station could be architecturally treated in order to be compatible with the surrounding Candlestick Park State Recreation Area. Landscaping could serve as a buffer area between the reservoir and houses on the hill to the north and the adjacent park area. The reservoir is slightly above the ground level, but a soil surface could be provided in order to cover the roof of the reservoir with grass. The pump station and odor control buildings could also be treated in such a manner as to blend with the surrounding park area

Construction Methods

Figure 5-11 shows a plan and geotechnical profile of the route of the apparent best alternative. A substantial length of the route will be excavated in the soft bay mud. The route will also have a portion of hard rock excavation, and the remaining length will be excavated in granular materials (fill and bay side sandy/gravelly deposits). Excavation for the reservoirs will involve clay, sandy/gravelly deposits, and hard rock. For more information on the geology of the area, refer to the Bayside Facilities Plan, Final Geotechnical Report (Reference 9).

Open Excavations. Most of the route for the apparent best alternative is proposed to be constructed by the open-cut method. It is expected that excavation of the fill and the sandy/gravelly deposits will be relatively easy and can be done by conventional means unless obstructions, such as piling, rubble, or old concrete foundations, are encountered. The younger bay mud may require special handling during excavation and may be inadequate as a working surface due to its high moisture content and plasticity. It may prove necessary to overexcavate the bay mud and any other weak material and replace it with granular fill to provide an adequate working surface.

Most of the rock excavations are expected to be in graywacke, sandstone, greenstone, and chert. Although the rock in the general area is weathered and fractured, massive graywacke or greenstone may be encountered which will be hard to excavate. Thus, in addition to conventional means, rock excavation may require use of heavy ripping or jackhammering and possibly drilling and blasting.

It will not be possible to use open-cut excavations with sloping sides because of the work area limitations at the ground surface and existing utilities or improvements adjacent to the alignment. Thus, trench sides will have to be retained by a temporary bracing system. The choice of bracing system will depend on the location, depth of excavation, soil and groundwater conditions, adjacent utilities and structures, and anticipated obstructions.

Since most of the fill and sandy/gravelly deposit excavations will be below the groundwater table, a positive dewatering system should accompany the excavation in order to ensure a dry working surface and satisfactory construction conditions.

The apparent best alternative includes pipelines varying in diameter. Sheeting systems such as steel sheet piling or soldier piles and lagging will probably be suitable to retain the trench sides along the soil portions of the alignment. Sheeting may also be used to retain the trench walls of the box transport structures in soils. A possible alternative for the box structures may be concrete walls constructed by the slurry trench method. The slurry wall system minimizes dewatering problems, and the wall can be used as a permanent wall as well as for temporary support. Rock bolts with wire mesh or a similar tie-back system will probably be needed to support cut slopes in rock during construction.

Foundation Support of Pipelines and Box Structures. The top of most of the transport structures will be about five feet below the ground surface. Depending on the height of the structure and the subsurface geologic profile, the bottom could be either in rock or soil. In general, the subsurface geologic profile consists of artificial fill overlying younger bay mud, which in turn is underlain by bay side sandy/gravelly deposits, older bay mud, and bedrock of the Franciscan Formation. Groundwater is typically less than 10 feet below the groundsurface along most of the proposed open cut sections.

Bearing capacity and settlement studies were conducted to provide a basis for the preliminary choice of the type of foundation. The results indicate that the bay side sandy/gravelly deposits, the older bay mud, and the bedrock materials will be capable of supporting all of the proposed structures without special treatment. However, the artificial fill and younger bay mud will not provide adequate support in all circumstances.

Due to the heterogeneous nature of the artificial fill, it is difficult to determine its engineering characteristics at all locations. For planning purposes, it may be assumed that the artificial fill will be capable of supporting all of the box structures and all pipelines less than 66 inches in diameter. Pipelines less than 66 lines in diameter will not impose loads exceeding the bearing capacity of the artificial fill. The box strucutres will probably be adequately supported on artificial fill since they distribute the imposed load over a large bearing surface. However, further studies must be made when more subsurface information and design details become available. Pipelines larger than 66 inches in diameter will exert loads exceeding the allowable bearing capacity of the artificial fill since the imposed load is not distributed over a large bearing surface. Where artificial fill exists beneath these large diameter pipes, support may be provided by removal of the artificial fill and replacement with two to five feet of well compacted granular bedding, or by the use of a pile foundation.

The younger bay mud is weak, compressible, and has a relatively low bearing capacity. It is thus capable of supporting only those structures which impose relatively small loads. For planning purposes, it may be assumed that pipelines with diameters less than 42 inches will not exert excessive loads, and therefore will not require special treatment. As with the artificial fill, box structures will probably be adequately supported, although further studies must be made. Pipelines larger than 42 inches in diameter will require special treatment since they do not distribute the imposed load over a large bearing surface. The pipelines may be supported by either pile foundations or by placement of a two to five foot thick layer of granular bedding to distribute the load.

The results of the settlement study indicate that some consolidation of the younger bay mud may occur if the combined weight of the structure, the bedding, and the trench backfill is larger than the weight of the excavated material, or if the thickness of artificial fill or granular bedding material beneath the structure is inadequate to distribute the imposed load. Settlements may be reduced appreciably by supporting the structure on piles, or by using lightweight backfill and bedding aggregate (unit weight of 60 pounds per cubic foot) to reduce the imposed pressure on the younger bay mud to the original soil pressure imposed by the excavated material. Uplift pressure on the box structures, when empty, is a problem which must be considered. A pile or thick mat foundation may be needed to resist the uplift pressure.

Reservoir and Pump Station Excavation and Foundation Support. Figures 5-12 and 5-13 show geotechnical profiles for the Sunnydale and Yosemite Reservoir sites, respectively. The borings drilled for the preliminary geotechnical investigation are shown on the figures. Table 5-1 summarizes the ground conditions and geotechnical recommendations at the two sites. The information and recommendations on Figures 5-12 and 5-13 and in Table 5-1 are approximate and preliminary in nature and will be refined as more information about the ground conditions and proposed construction methods becomes available.

Energy Requirements

The energy requirements of the apparent best alternative are presented in Table 5-2. Annual dry weather energy consumption is based on dry weather pumping only at the proposed Yosemite Pump Station. Annual wet weather energy consumption includes wet wether pumping, dewatering, odor control, and flushing requirements at both reservoirs. Peak demand for dry weather pumping consists of a peak dry weather rate of 10 mgd and dry weather pumping auxiliary services. The peak wet weather demand consists of wet weather pumping of 120 mgd from the Yosemite Pump Station, dewatering at 60 mgd from the Sunnydale Reservoir, auxiliary services, and odor control and cleaning systems.

Traffic Considerations

When in operation, the Sunnydale and Yosemite Reservoirs will be unmanned but will be visited occasionally by a roving operations and maintenance crew. Therefore, traffic disruption due to operation of the facilities following construction will be insignificant. Traffic impacts due to construction activities, however, will be significant.

Construction Impacts. In the Sunnydale basin area, construction will take place along Tunnel Avenue and Alana Way. A traffic lane will be maintained along the east side of Tunnel Avenue to

Table 5-1 Subsurface Conditions at the Apparent Best Alternative Sunnydale-Yosemite Reservoir Sites

Description	Site location	
	Sunnydale	Yosemite
Ground surface elevation,[a] ft		
Highest point	+50	+4
Lowest point	+13	+2
Average surface elevation	+23[b]	+3
Overburden depth, ft		
Deepest point	15	162
Shallowest point	0	15
Average depth	2	100
Type	Gravelly sand, silty sand, and silty clay	16 ft gravelly sand, 20 ft soft clay, 65 ft sandy clay
Bedrock elevation, ft		
Highest point	+50	-15
Lowest point	0	-160
Average elevation	+22	-97
Type	Greenstone, chert, and graywacke; all highly weathered and fractured	Graywacke, highly weathered and fractured
Groundwater elevation, ft	+8	-3
Expected structural bottom elevation, ft	-27	-25.5
Potential problems	Uplift, rock excavation	Uplift, difficult dewatering
Rock excavation method	Blasting and/or ripping	Blasting and/or ripping
Support requirements	Soil: 2:1 cut, or sheet piles, wales, and struts or soldier piles and lagging	Soil: slurry wall, or sheet piles, wales, and struts
	Rock: rock bolts or tie back system	Rock: rock bolts or tie back system
Probable foundation type	Mat	Mat
Bearing capacity, psf	Soil: 2,000 Rock: 30,000	Soil: 2,000 Rock: 50,000
Estimated settlement	Negligible	Negligible
Uplift resistance method	Thick backfill above structure or thick mat foundation or friction piles and/or rock anchors	Thick backfill above structure or thick mat foundation or friction piles and/or rock anchors
Probable dewatering system	Well points and sump pumps	Deep wells or well points and sump pumps, minimal if slurry wall is used
Geotechnical rating	Very good	Fair

[a]All elevations are referred to San Francisco City Datum.

[b]Average surface elevation is not the arithmetic average of the elevations of the highest and lowest points. More of the site area is closer in elevation to the lowest point because of the steep embankment on the north side of the site.

Table 5-2 Energy Requirements for Apparent Best Alternative Sunnydale-Yosemite Transport/ Storage Facility

Power component	Stage II and Stage III
Annual energy consumption, kwhr/yr	
Dry weather pumping	200,000
Wet weather pumping	90,000
Odor control	260,000
Cleaning system	30,000
Auxiliary services	80,000
Total	660,000
Peak demand, kw	
Dry weather operations	91
Wet weather operations[a]	2,236

[a]Note: Wet weather operations include odor control and flush system energy demands.

permit access to The Ceco Corporation and Scavenger Road leading to the scavenger operation. Tunnel Avenue may need to be temporarily widened to the west to allow detouring around the construction in Tunnel Avenue. Construction of the 66-inch pipeline on Alana Way will take place within the right-of-way, but off the roadway wherever possible. At least one traffic lane will be maintained on Alana Way when construction must take place within the roadway. If necessary, the trench will be covered to provide vehicular access to adjacent properties.

In the Yosemite basin area, Ingalls and Griffith Streets and Carroll and Thomas Avenues will be impacted. Construction will be staged along these streets to facilitate the flow of traffic. Vehicular access to side streets will be provided by limiting construction to one-half of each intersection at a time. Boring under active railroad tracks will be required to keep tracks in operation. Tracks that can be severed because of little or no use will be crossed by open-cut construction.

On Ingalls Street, between Carrol and Fitzgerald Avenues, construction will take place on the west side. A 12-foot-wide traffic lane will be maintained on the east side of Ingalls Street without tearing up the sidewalk. Vehicular access to Donner Avenue will be provided by the traffic lane maintained on the east side of Ingalls Street. A traffic lane will be maintained on the south side of Carroll Avenue. The business on the north side of Carroll Avenue near Fitch Street could be provided with vehicular access by means of a bridge over the trench, if necessary.

On Ingalls Street, between Carroll and Yosemite Avenues, all construction will take place on the west side. A lane will be maintained along the east side of Ingalls Street. Between Yosemite and Thomas Avenues, construction will shift to the east side of Ingalls Street, leaving the west side of the street available for a traffic lane. Businesses on the west side of Ingalls Street between Carroll Avenue and Yosemite Avenue have access to the cross streets and will not need vehicular access on Ingalls Street. Buildings on the east side at Ingalls Street and on cross streets east of Ingalls Street will have access along the lane maintained on the east side of Ingalls Street. Between Yosemite Avenue and Thomas Avenue, buildings on the west side of Ingalls Street will have access via a lane maintained on the west side of Ingalls Street. Buildings on the east side of Ingalls Street will be without vehicular access directly from Ingalls Street. Vehicular access to Wallace Avenue and Van Dyke Avenue could be provided by limiting construction to one-half of each intersection at a time.

On Thomas Avenue, construction will take place along the south side of the street. A traffic lane will be provided along the north side of Thomas Avenue, allowing small vehicle access to businesses on the north side of Thomas Avenue, but preventing large trucks from backing into or out of businesses. If necessary, access for small vehicles will be provided to businesses along the south side of Thomas Avenue by means of bridges over the trench. Access to and from the southern end of Griffith Street can be provided by staged construction of the trench as it crosses Griffith Street. Construction will take place on the west side of Griffith Street, and a 12-foot-wide traffic lane will be maintained on the east side of the street. This lane will provide access to side streets east of Griffith Street.

In the Evans Avenue area, construction will also be phased to facilitate the movement of traffic. On Fairfax Avenue, one traffic lane will be maintained on the south side of the street. One traffic lane will be maintained on the west side of Newhall Street, and one west bound lane and two east bound lanes will be maintained on Evans Avenue. One north bound lane and two south bound lanes will be maintained on Third Street. One lane will be maintained on the south side of Custer Avenue. If necessary, vehicular traffic to buildings will be provided by means of bridges over the trench.

Haul Routing. Potential outbound and inbound haul routes are presented in the Traffic Impacts Analysis Report (Reference 10) for all elements of the Sunnydale-Yosemite Transport/Storage Facility.

Solids Management

In order to identify solids management strategies for the Bayside Facilities, a review was conducted of the operation and performance of existing wet weather transport and storage facilities. Information on solids transport, deposition and resuspension was obtained for various facilities throughout the country, and solids management practices in San Francisco were reviewed. Based on this information, general details and costs were developed for the operation and maintenance of transport/storage facilities and storage reservoirs.

Solids present in wet weather flow consist of grit, screenings, and scum. It is recommended that solids be contained as much as possible within the system and conveyed to treatment plants for removal and disposal. Grit may tend to settle in reservoirs or transport/storage facilities due to reduced flow velocity. Grit would be resuspended after settling by flushing the facilities with water. After resuspension, the grit would be transported to the treatment facilities for removal and disposal.

The Bayside Facilities Plan, Solids Handling Report (Reference 11) includes preliminary design criteria and considerations for solids handling in the Bayside Facilities. Details and costs are based on the recommended concept of resuspension of solids and transport rather than or direct removal.

Figure 5-14 is an isometric drawing showing a fixed-nozzle solids resuspension system for a covered reservoir. Similar spray piping systems will be installed at both the Sunnydale and Yosemite Reservoirs and in the concrete box transport/storage elements. Nozzle pressure is 150 pounds per square inch (psi), and the flow rate is about 30 gpm per foot of floor length. Therefore, if one 100-foot-long section of structure is flushed, 3,000 gallons per minute (gpm) of water would be required. The central discharge channel in the reservoirs will be flushed at a velocity of about 5 feet per second (fps).

There are four possible water sources for solids resuspension: treated wastewater effluent, settled and screened sewage from the reservoir itself, the City's domestic water supply, and groundwater from wells. In order to utilize treated effluent for cleaning the reservoirs, screens and a high-pressure pump station would be required at the Southeast WPCP with 16-inch pipelines running approximately 21,000 feet to the Yosemite and Sunnydale Reservoirs. Figure 5-15 is a drawing showing a possible route and an alternate alignment for the required treated effluent flushwater system. This installation would cost approximately $6.0 million to construct. By comparison, the system utilizing domestic water would cost approximately $2.5 million to construct.

On the bay side of the City, feasible groundwater aquifers are limited to deposits of sandy soils with permeabilities high enough to permit groundwater extraction using wells. These deposits of sand are restricted to the subsurface troughs created by old creeks such as Islais Creek and the creek leading to the South Basin Canal. Other areas contain clayey soils with permeabilities too low for practical groundwater extraction.

The deposits of sand in the old creek beds are not extensive, and it is impossible to predict the annual rate at which the aquifers would be recharged without additional aquifer tests. In addition, it is impossible to predict whether freshwater would flow into the aquifers from the hills or whether saltwater would flow in from the bay. Salty flushing water may prove detrimental to the biological treatment processes at the Southeast WPCP.

Therefore, groundwater cannot be considered for flushing the Bayside Facilities without detailed aquifer testing for the following reasons:

1. The extraction of groundwater may cause local ground subsidence and building damage if the rate of recharge is not great enough.

2. If the rate of recharge is not great enough, the aquifers may have a useful life of only a few years.

3. If the aquifers are recharged largely by water from the bay, the flushing water may become too salty for biological treatment processes.

Costs for a system to resuspend and flush solids from the covered reservoirs and transport/storage structures are included in the detailed cost estimate for the apparent best alternative, and are based on obtaining water from the domestic water supply, as shown on Figures 5-1 and 5-2. For the transport/storage elements, preliminary estimates indicate that costs for a fixed nozzle spray system run approximately 10 percent of the construction cost for the element itself. Assuming two flushing cycles per month during the 7-month wet weather period, Alternative 2A-1 requires approximately 30,000 kwhr per year of energy for facility cleaning.

Odor Control

General concepts and costs for odor control systems for the apparent best alternative are based on the Bayside Facilities Plan Odor Control Program (Reference 12). In the first phase of the program, a review was made of potential odor problems associated with operation of combined wastewater facilities. A prototype odor monitoring study was developed that focused on the most probable odor problems associated with operation of the proposed facilites. The prototype odor testing was conducted during the winter of 1979-80 at the Baker Street dissolved air flotation treatment facility and at the Southeast Water Pollution Control Plant. During these tests, odors were monitored from all phases of operation of a combined wastewater storage facility. These phases included facility filling when clean or unclean; flow-through operation; long-term storage (up to 120 hours); facility emptying; and an empty, uncleaned facility. The highest continuous odor emissions came from exposed solids after dewatering a facility. If the facility was rapidly refilled without cleaning, the highest short-term odor emission resulted. Odor impacts from clean facility filling, flow-through operation, long-term storage, and facility emptying were less significant than this condition.

The potential downwind odor impacts associated with the operation of the proposed Bayside facilities were estimated. These are based on odor emission rates for the various modes of operation and micrometeorological conditions. This analysis shows that the reservoirs at Sunnydale and Yosemite could have potential odor impacts and should be fitted with odor control facilities. It also shows that facility washing after use is an important odor control measure, and that long-term (120 hours) combined wastewater storage does not present a significant odor risk. The in-line transport/storage facilities provide a lesser odor risk than the reservoirs and probably do not require odor control. Washing of the in-line transport/storage facilities after use, however, is desirable to maintain an acceptable odor risk.

Alternative odor control systems were evaluated for Bayside Facilities (Reference 12). The two systems that were found to be the cost-effective systems were activated carbon and permanganated alumina. Sizing and cost of an odor control system is predominantly affected by the ventilation rate. Ventilation rates were selected that would provide odor removal for all air displaced during facility filling at the peak inflow rate for a one-year storm and also provide six air changes per hour for manned entry. The fan capacities will also provide a minimum of two air changes per hour within the total reservoir volume when empty. The odor control systems will only operate intermittently during the wet weather season. A total fan capacity of 50,000 cubic feet per minute (cfm) is required at each reservoir. Two 50-horsepower fans would be provided. Figure 5-16 is a schematic diagram showing pertinent features of the odor control system for a reservoir. Flexibility and reliability are provided by multiple fan and odor control units.

Construction costs for odor control utilizing activated carbon units and fans are included in the detailed cost estimate for the apparent best alternative. The annual operating and maintenance (O&M) cost is determined by estimating power costs based on intermittent operation for 6 months per year, and adding other costs including general maintenance and caustic and carbon for on-site regeneration and replacement. The annual O&M cost for odor control is estimated at $80,000 each for the Sunnydale and Yosemite Reservoirs. The average energy consumption at each reservoir is estimated to be 260,000 kwhr per year

Control System

A control system is required to make the wastewater facilities function properly as a whole to reduce overflows of combined sewage to the levels prescribed by the NPDES discharge permits.

Summary Results of the Control System Program. As part of the Bayside Facilities Planning Project, a study was conducted to determine the most cost-effective method for flow management and automatic control of the major wastewater facilities throughout the City. The principal objective of that study was to develop a citywide control system that will interface with the local dedicated controls at the remote facilities during storm conditions and regulate their operation for optimum utilization of available storage and treatment prior to any overflow event. The results of that study were published in the Citywide Control System Report, dated February 1981 (Reference 13).

The citywide control system, as recommended by the report, is based upon a supervisory control concept. This concept utilizes local dedicated controllers at each physical facility to carry out the flow management and control decisions made by the supervisory control system. The recommended control system is based upon a distributed and heirarchical configuration consisting of a supervisory control center (SCC), two area control centers (ACCs), and several field terminal units (FTUs) which provide the neccessary interface between the various local controllers and the supervisory control system. Figure 5-17 depicts this configuration and the locations of the components.

Control of Sunnydale-Yosemite Facilities. Based upon the supervisory control concept, discussed above, local dedicated control systems will be required for the Sunnydale/Yosemite Facility. These control systems will perform the following functions:

1. Control the local mechanical equipment based upon the set point commands received from the citywide supervisory control system through the bay side ACC.

2. Operate the facilities in a safe manner in case of communication failure between the supervisory system and the local controls. If communications are lost between the bay side ACC and the local dedicated control systems, the local systems will continue to provide reactive control of the local facilities without receiving any supervisory commands.

Generally, conventional and microcomputer are the two types of control equipment which are applicable for local controls. The microcomputer-based control systems are more reliable than conventional systems and require less maintenance. In addition, microcomputers are generally more cost competitive in larger applications. Therefore, the basic automatic controls for the Sunnydale-Yosemite Transport/Storage Facility will utilize a microcomputer-based control system.

The greatest benefit from microcomputer technology is obtained when all control functions in a single facility are combined into a single computer. This reduces the number of mechanical devices and the required interconnections. However, in order to prevent potentially catastrophic failures due to computer malfunction, conventional protective devices must also be provided for critical control functions. The exact balance between the computer hardware and conventional hardware will be determined during design since the local instrumentation needs and complexity can never be fully anticipated during the planning phase. The designer can balance the design considering not only the costs, but also the reliability requirements for each control function. In general, it will be desirable to utilize the microcomputer for sequential control, such as the speed regulation and sequencing of the various pumping units, and conventional hardware for critical interlocks, such as low and high wet well level switches for stopping and starting the pumps.

Operations and Maintenance

The continual successful performance of the Sunnydale-Yosemite Transport/Storage Facility will rely on a good operations and maintenance program.

Standard Operations and Maintenance Procedures. Most of the operational requirements for the apparent best alternative are associated with the Sunnydale and Yosemite Reservoirs and their associated pump stations. These operation requirements will vary significantly with the season but will not vary between Stage II and III since all facilities will be constructed in Stage II.

During the dry weather season, flow is transported through the facilities to the Southeast WPCP for treatment. Operations and maintenance activities will consist of maintaining flow through the existing sewers and the cunnettes of the large transport/storage structures and ensuring that the dry weather pumps and force main at the Yosemite Pump Station operate correctly. A minimum of attention will be required by operating personnel during dry weather. Daily inspections of the reservoirs and the Yosemite Pump Station by a roving crew will normally be sufficient.

During the wet weather season, all transport/storage facilities will be activated during significant storms. All operations are automatic, however, so on-site staffing of facilities is not required. Periodic inspections by a roving crew will still be sufficient, except during cleaning of the facilities following a storm. Cleaning is expected to occur twice a month during the wet weather season and will require a crew to operate the flushing system while cleaning the facilities.

Dry weather pumps at the Yosemite Pump Station will operate daily throughout the year, whereas the wet weather pumps will only operate when there is a storm. The dewatering pumps at the Sunnydale Reservoir are expected to operate only after each major storm. However, the dewatering pumps are expected to receive the greatest wear since they will pump out grit and solids deposited in the reservoir. The dry weather season is the best time to perform major maintenance on wet weather pumps and associated equipment since they do not need to be placed in service at short notice.

The use of electric motors to drive all the pumps eliminates the problem of frequent exercise that would be required to keep internal combustion engines ready for service. Electric drives also require a minimum of maintenance for wear.

Staffing Requirements. The operations and maintenance of the facilities will be the responsibility of the Department of Public Works, Bureau of Water Pollution Control. Personnel requirements will be greater during wet weather months than dry weather months. No permanent on-site personnel will be assigned to the facilities at any time; roving crews will periodically inspect the facilities. The recommended staffing requirements for the apparent best alternative are presented in Table 5-3.

Training. A training program will be initiated to train personnel in the operation and maintenance of the Sunnydale-Yosemite and Hunters Point facilities. The training program will consist of both classroom sessions and "hands-on" sessions where the operators actually work with the installed equipment. For this reason, the training program will be coincident with the start-up period following completion of construction of each stage. The training program will cover normal and emergency operations during both dry and wet weather, reservoir flushing and cleaning operations, and routine maintenance procedures.

Table 5-3 Recommended Staffing Requirements for Apparent Best Alternative Sunnydale-Yosemite Transport/Storage Facility

Staff classification	Sunnydale Reservoir	Yosemite Reservoir and Pump Station	Transport/storage structures	Total
Superintendent	25	25	-	50
Foreman	53	53	-	106
Operator	289	420	-	709
Custodian crew	63	63	-	126
Maintenance crew	17	22	20	59
Total	447	583	20	1,050

HUNTERS POINT TRANSPORT FACILITY

The apparent best alternative for the Hunters Point Transport Facility is Alternative 16C-1. The features of this alternative are shown on Figure 5-18, and a profile is presented on Figure 5-19.

Subsequent to the selection of this alternative in Chapter 4, the Inchon-Solomon subarea was added to the Hunters Point drainage basin. This resulted in additional stormflow to the proposed facility and required a larger gravity sewer transport system. Sizes of gravity sewers shown in Chapter 3 have been increased in Chapter 5 to provide the necessary capacity. Construction costs given in this chapter have also been modified to reflect the additional costs.

Description of Proposed Facilities

The existing dry weather system will be retained in the apparent best alternative. The local collection system conveys dry weather flow to the existing Hunters Point Pump Station. The sewage is pumped through a 10-inch-diameter force main to a 10-inch-diameter gravity sewer in Hunters Point Boulevard. At Evans Avenue, the diameter of the sewer increases to 12 inches. At Keith Street, the sewage enters a 21-inch sewer and proceeds via Keith Street and Fairfax Avenue to the Southeast WPCP for treatment.

Wet weather is conveyed by gravity sewers under the apparent best alternative. The existing Griffith Street North Outfall is plugged, and up to 32 mgd of wet weather flow is diverted into a 36-inch-diameter gravity sewer installed in Innes Avenue and Hunters Point Boulevard. This sewer connects to the existing diversion structure on the Hudson Avenue Outfall. The structure will be modified to combine the flow in the 36-inch sewer with the 1-year storm flow from the area tributary to the Hudson Avenue Outfall. The combined flow is conveyed in a 42-inch-diameter sewer installed in Hunters Point Boulevard, an easement on the Pacific Gas and Electric Company power transmission line right-of-way, and along Evans Avenue to Middle Point Road. At this location, wet weather flow from the existing Middle Point Road sewer is added through a new, short 27-inch-diameter sewer. Downstream of this junction, a 48-inch-diameter sewer conveys the flow to the existing Evans Avenue sewer at Keith Street. The wet weather system cannot be used for dry weather flow because velocities would be too low to keep solids in suspension.

An easement will be acquired from Pacific Gas and Electric Company so that the 42-inch sewer can be installed in lower terrain, thereby avoiding the deep trench excavations associated with an alignment along Hunters Point Boulevard. Even so, the proposed trench is approximately 38 feet deep in Hunters Point Boulevard at the south end of the easement. In order to avoid this deep excavation, it may be possible to acquire another easement at a low elevation around the east side of the bluff just north of the Hunters Point Pump Station. This possibility will be explored during the design phase of the project. If the deep excavation cannot be avoided, the deep section will be encased in reinforced concrete to ensure the structural integrity of the sewer.

As a part of the apparent best alternative, several modifications are required to the existing Evans Avenue sewer. The first modification is a connection between the existing Evans Avenue and Mendell Street sewers at the intersection of Evans Avenue and Lane Street as shown on Figure 5-18. A low level weir will be installed in the connection to ensure that the dry weather flow continues in the Evans Avenue sewer to Keith Street where it drops into the 21-inch Keith Street sewer and proceeds on to the Southeast WPCP via Keith Street and Fairfax Avenue. Wet weather flow that overtops the weir will be conveyed by the Mendell Street sewer to the Islais Creek Southside Outfalls Consolidation.

The second modification is a connection at the intersection of Fairfax Avenue and Mendell Street between the Evans Avenue sewer and the proposed 90-inch-diameter sewer to be constructed as a part of Alternative 2A-1 for the Sunnydale/Yosemite facilities. This connection will be equipped with a weir designed to permit excess wet weather flow to pass to the new 90-inch sewer after the Mendell Street sewer reaches capacity. Dry weather flow will remain in the Evans Avenue sewer. The Evans Avenue Outfall will remain in service as an overflow point for wet weather flows generated by storms with a recurrence interval greater than 1 year.

The third modification involves construction of a high level weir structure on Evans Avenue just southeast of the drop manhole at the Keith Street intersection. This weir would contain wet weather flows from storms with less than a 1-year recurrence interval in the Evans Avenue sewer upstream of Keith Street and force these flows over the low level weir into the Mendell Street sewer and over the weir at the Fairfax Avenue connection. The new weir structure at Keith Street will permit excessively heavy wet weather flows from the Evans Avenue sewer to pass on to the existing Evans Avenue Outfall. Overflows from the Evans Avenue Outfall would average no more than one per year since all the flow from a 1-year storm would be diverted to the Islais Creek Southside Outfalls Consolidation through the Mendell Street and Fairfax Avenue connections.

Construction Methods

Figure 5-20 shows a plan and geotechnical profiles for the apparent best alternative for Hunters Point. The profile should be considered preliminary because it is based mainly on information obtained from the limited number of borings drilled during the present study. The profile will be updated as more information from the expanded geotechnical program becomes available.

The apparent best alternative is located in the Fort Point-Hunters Point shear zone. Bedrock is near surface and consists of serpentinite with blocks of greenstone and graywacke inclusions. The rock is overlain by 5 to 50 feet of artificial fill and sandy/gravelly deposits (colluvium).

The 36-inch-diameter sewer passes through 225 feet of greenstone and 475 feet of gravelly deposits. The 42-inch-diameter sewer passes through 450 feet of greenstone and 1,350 feet of serpentinite. The 48-inch-diameter sewer passes through 250 feet of serpentinite and 350 feet of fill.

Open Excavations. The sewers will be constructed by the open-cut method. It is expected that excavation of the fill and the sandy/gravelly deposits will be relatively easy and can be done by conventional means unless obstructions such as wood piling and rubble are encountered in the fill. All of the rock excavations will be in serpentinite and greenstone. Although most of the rock in the general area is weathered and fractured, some competent serpentinite or massive greenstone may be encountered which would be difficult to excavate. Thus, in addition to conventional means, rock excavation may require use of heavy ripping or jackhammering and possibly drilling and blasting.

It is anticipated that the trench sides for most of the proposed pipelines and transport/storage structures will be cut vertically to minimize the width of the working area. Trench sides will have to be retained by a temporary bracing. Since most of the excavations of the fill and sandy/gravelly deposits will extend below the groundwater table, steel sheet piling appears to be the most suitable support system.

Dewatering. Since most of the fill and sandy/gravelly deposit excavation will be below the groundwater level, a positive dewatering system should accompany the excavations to ensure a dry working surface and allow for satisfactory construction conditions. A well point system appears to be suitable for the conditions expected, and sump pumps may be needed for excavations in bedrock.

Bearing Capacity. The estimated bearing capacity of the serpentinite and greenstone rocks is about 30,000 psf. The estimated bearing capacity of the fill and sandy/gravelly deposits varies with depth and ranges between 2,000 and 4,000 psf. The bedrock, gravelly deposits, and most of the fill should be capable of supporting all the expected pressures adequately, both during and after construction.

Settlement. The anticipated settlements of the fill and sandy/gravelly deposits due to the sewers and backfill pressures will be negligible. Temporary support construction and dewatering should be carefully controlled to minimize the construction settlements. It is very important not to disturb the sensitive younger bay mud. Granular backfill should be carefully placed to fill and compact the voids left by the removal of the temporary supporting system. Dewatering may be performed together with water injection at close spacing to avoid densification of granular soils.

Energy Requirements

The energy requirements of the apparent best alternative are presented in Table 5-4. Within Hunters Point, energy is consumed only for pumping at the existing Hunters Point Pump Station. There is no difference in the energy requirements between Stage II and Stage III. Additional energy will be consumed at the Crosstown Pump Station. See the Crosstown Project Report for information on energy consumption at the Crosstown Pump Station.

Traffic Considerations

Traffic disruption associated with the apparent best alternative will be limited to the period of construction since the facilities consist of underground sewers.

Construction Impacts. Potential impacts during construction include disruption of traffic flow along Evans Avenue, Hunters Point Boulevard, and Innes Avenue. The working area will be limited to two traffic lanes in order to minimize this disruption. Construction at the intersection of Evans Avenue and Middle Point Road could affect operation of the MUNI No. 44 bus line, so this intersection will not be closed to through traffic. Access to businesses and residences along the alignment of the apparent best alternative will be maintained during construction either by bridging the open trench or providing a traffic lane on both sides of the street. Street closures and detours will not be required to construct the apparent best alternative.

Haul Routing. Due to geographical constraints, hauling of spoils from the project area will follow Evans Avenue and Third Street to freeway on-ramps. Hauling will result in accessing both U.S. 101 and I-280. Localized traffic disruptions may occur at haul truck entry and exit points along those streets accessing each freeway ramp. Traffic disruptions associated with the hauling will be significant only during the weekday peak traffic periods. Outbound and inbound haul route options are presented in the Bayside Facilities Plan, Traffic Impacts Analysis Report (Reference 10).

Table 5-4 Energy Requirements for Apparent Best Alternative, Hunters Point Transport Facility

Power component	Stage II and Stage III
Annual energy consumption, kwhr/year	
Dry weather pumping	25,000
Wet weather pumping	5,000
Auxiliary services	10,000
Total	40,000
Peak demand, kilowatts	
Dry weather operations	33
Wet weather operations	51

Solids Management

The apparent best alternative consists of the existing dry weather system plus new gravity sewers and diversion structures to accommodate wet weather flow. The dry weather system was retained because the dry weather flow rates are too low to provide sufficient velocities to transport solids in the wet weather gravity sewers. The new gravity sewers have been sized to provide scouring velocities during wet weather flows. There are no storage reservoirs or large transport/storage structures associated with the apparent best alternative. Therefore, no special flushing or cleaning facilities are required.

Odor Control

For reasons similar to those described under Solids Management above, no special odor control facilities are required for the apparent best alternative. The existing Hunters Point Pump Station, equipped with ventilation fans, has operated for years without complaints of odors. Numerous diversion structures similar to those associated with the apparent best alternative have been installed throughout the City without producing an odor nuisance.

Control System

The general concepts of the citywide supervisory control system were previously described in the section on the Sunnydale-Yosemite Transport/Storage Facility. The only mechanical component of the apparent best alternative for Hunters Point is the existing pump station. This simple pump station operates on reactive wet well level control, and no change in operational control is anticipated. Certain pump status and operating condition data may be transmitted to the area control center at the Southeast WPCP for monitoring. Since the wet weather system is a complete gravity system with no mechanical components, no control system is required.

Operations and Maintenance

The apparent best alternative consists of retaining the existing Hunters Point Pump Station and force main system and installing new gravity sewers for wet weather flow. The operations and maintenance requirements for the pump station and force main will be no different than at present and will require no additional staffing by the Bureau of Water Pollution Control. There are obviously no operating requirements for the new gravity sewer system. Maintenance for the gravity sewers will require approximately 0.1 employee-years of additional labor for routine inspection and cleaning. This additional labor will be accomplished by a regular sewer maintenance crew. No training program will be required.

FINAL FLOW RELATIONSHIPS

The apparent best alternative for the Crosstown Project incorporates the use of the Islais Creek Reservoir as both a storage and a treatment facility (see Reference 1). The relationships between the wet weather flows from the Sunnydale-Yosemite and Hunters Point transport/storage facilities and the other Bayside Facilities in Stages II and III in the Store/Treatment are shown schematically on Figure 5-21.

IMPLEMENTATION SCHEDULES

Implementation schedules for the Southeast Bayside Project Facilities will be provided once the overall Clean Water Program implementation schedule is determined. Negotiations are now under way with the state to establish this overall schedule.

DETAILED COST ESTIMATE

Detailed, unescalated cost estimates for the Sunnydale-Yosemite Transport/Storage Facility and the Hunters Point Transport/Storage Facility are presented in Tables 5-5 and 5-6, respectively. The cost estimates are based on construction bid and land costs as of January 1980 (ENR 3800). Detailed escalated project costs will be provided when implementation schedules for the facilities become available. These schedules are fully dependent on the availability of federal and state funding which cannot be predicted at the time of this report.

Estimated annual costs of labor and materials for the operations and maintenance of the Southeast Bayside Project are presented in Table 5-7, and the estimated annual electrical energy costs to operate the facilities are presented in Table 5-8. These costs are based on January 1980 prices.

FINANCIAL PLAN AND REVENUE PROGRAM

The Clean Water Program will develop the Financial Plan and Revenue Program based on the material presented in this report. For purposes of planning this project, the Clean Water Program Master Plan Summary Schedule, dated June 10, 1980, and revised on October 16, 1980, was used. However, the future availability of federal and state funding is unknown at the time of this report,

Table 5-5 Estimated Costs of Apparent Best Alternative Sunnydale-Yosemite Transport/Storage Facility

Cost item	Cost, millions of dollars
Construction contract	
Contract 1 (Sunnydale)	
Reservoir	
General site work	0.323
Excavation and backfill	1.000
Structural	5.131
Mechanical	0.259
Electrical/instrumentation	0.407
Cleaning system	0.772
Odor control system	0.600
Subtotal	8.492
Box conduits	
Excavation, structure, backfill, and restoration	2.040
Cleaning system	0.204
Circular sewers	
Excavation, conduit, backfill, and restoration	2.240
Pile foundation	0.241
Subtotal	2.481
Miscellaneous structures	0.580
Subtotal	13.797
Contract 2 (Yosemite Transport/Storage)	
Box conduits	
Excavation, conduit, backfill, and restoration	12.404
Pile foundation	0.840
Cleaning system	1.324
Subtotal	14.568
Circular sewers	
Excavation, conduit, backfill, and restoration	4.238
Pile foundation	0.242
Subtotal	4.480
Miscellaneous structures	0.240
Subtotal	19.288
Contract 3 (Yosemite Pump Station and Reservoir)	
Pump station and reservoir	
General site work	0.910
Excavation and backfill	2.878
Structural	14.416
Mechanical	3.277
Electrical/instrumentation	1.560
Cleaning system	2.364
Odor control system	0.600
Subtotal	26.005
Force mains	
Excavation, conduit, backfill, and restoration	1.314
Miscellaneous structures	2.475
Subtotal	29.794

Table 5-5 Estimated Costs of Apparent Best Alternative Sunnydale-Yosemite Transport/Storage Facility, ENR 3800 (continued)

Cost item	Cost, millions of dollars
Contract 4 (Yosemite to Islais Transport)	
Circular sewers	
Excavation, conduit, backfill, and restoration	4.062
Pile foundation	0.604
Subtotal	4.666
Miscellaneous structures	0.250
Subtotal	4.916
Subtotal, construction contract 1 (Sunnydale)	13.797
Subtotal, construction contract 2 (Yosemite)	19.288
Subtotal, construction contract 3 (Yosemite)	29.794
Subtotal, construction contract 4 (Yosemite)	4.916
Total construction cost, Sunnydale-Yosemite Transport/ Storage Facility	67.795
Contingencies (10 percent) plus professional services (16 percent)	17.627
Land	
Sunnydale Reservoir	1.200
Yosemite Reservoir	0.510
Easements	0.525
Total land and easements	2.235
Interest during construction	9.130
Total capital cost	96.787

Table 5-6 Estimated Costs of Apparent Best Alternative Hunters Point Transport Facility

Cost item	Cost, millions of dollars
Construction	
Circular sewers	
Excavation, conduit, backfill, and restoration	2.348
Miscellaneous structures	0.213
Total	2.561
Contingencies (10 percent) plus professional services (16 percent)	0.666
Land (easements)	0.050
Interest during construction	0.172
Total capital cost	3.449

Table 5-7 Estimated Annual Costs of Labor and Materials for Operation and Maintenance for the Southeast Bayside Project

Facility	Cost, thousands of dollars		
	Labor	Materials	Total
Sunnydale Reservoir	140.7	34.5	175.2
Yosemite Reservoir and Pump Station	164.4	44.5	208.9
Sunnydale-Yosemite Transport/Storage Elements	6.5	0	6.5
Hunters Point Transport/Storage Facility	3.0	0	3.0
Total	314.6	79.0	393.6

Table 5-8 Estimated Annual Energy Costs for the Southeast Bayside Project

Facility	Stage II and III cost, thousands of dollars					
	Pumping		Odor control	Cleaning	Auxiliary services	Total
	Dry weather	Wet weather				
Sunnydale-Yosemite Transport/Storage Facility	26	12	33	4	10	85
Hunters Point Transport/Storage Facility	2.5	0.5	0	0	1	4
Total	28.5	12.5	33	4	11	89

and therefore a definite schedule cannot be established. Without a definite schedule, development of a Financial Plan and Revenue Program is impractical. The SWRCB has agreed with this position and has noted that the Financial Plan and Revenue Program will be developed when adequate information is available.

APPENDIX A

REFERENCES

APPENDIX A

REFERENCES

1. Caldwell-Gonzalez-Kennedy-Tudor, Consulting Engineers. Bayside Facilities Plan, Crosstown Project. Prepared for San Francisco Clean Water Program. March 1982.

2. Caldwell-Gonzalez-Kennedy-Tudor, Consulting Engineers. Bayside Facilities Plan, North Bayside Project Report. Prepared for San Francisco Clean Water Program. March 1982.

3. Metcalf & Eddy/Engineers. Southwest Water Pollution Control Plant Project, Final Project Report. Prepared for Department of Public Works, City and County of San Francisco. February 1980.

4. San Francisco Department of City Planning. Southwest Water Pollution Control Plant, Final Environmental Impact Report. Certified August 23, 1979.

5. Malcolm Pirnie, Inc. Wastewater Program Overview for the City and County of San Francisco. Prepared for San Francisco Clean Water Program. January 1980.

6. Caldwell-Gonzalez-Kennedy-Tudor, Consulting Engineers. Bayside Facilities Plan, Background Report. Prepared for San Francisco Clean Water Program. March 1982.

7. Caldwell-Gonzalez-Kennedy-Tudor, Consulting Engineers. Bayside Facilities Plan, Interim Report. Prepared for San Francisco Clean Water Program. April 1980.

8. Caldwell-Gonzalez-Kennedy-Tudor, Consulting Engineers. Bayside Facilities Plan, Spoils Disposal Report. Prepared for San Francisco Clean Water Program. February 1982.

9. Caldwell-Gonzalez-Kennedy-Tudor, Consulting Engineers. Bayside Facilities Plan, Final Geotechnical Report. Prepared for San Francisco Clean Water Program. March 1981.

10. Caldwell-Gonzalez-Kennedy-Tudor, Consulting Engineers. Bayside Faciliites Plan, Traffic Impacts Analysis Report. Prepared by J. Warren & Associates for San Francisco Clean Water Program. February 1981.

11. Caldwell-Gonzalez-Kennedy-Tudor, Consulting Engineers. Bayside Facilities Plan, Solids Handling Report. Prepared for San Francisco Clean Water Program. March 1982.

12. Brown and Caldwell, Consulting Engineers. <u>Odor Control Program, Bayside Facilities Plan</u>. Prepared for Caldwell-Gonzalez-Kennedy-Tudor, Consulting Engineers. November 1980.

13. Caldwell-Gonzalez-Kennedy-Tudor, Consulting Engineers. <u>Bayside Facilities Plan, Citywide Control System Report</u>. <u>Prepared for San Francisco Clean Water Program</u>. February 1981.

APPENDIX B

ABBREVIATIONS AND ACRONYMS

APPENDIX B

ABBREVIATIONS AND ACRONYMS

average dry weather flow	ADWF
Bay Conservation and Development Commission	BCDC
British thermal unit	Btu
Candlestick Point State Recreation Area	CPSRA
centimeter(s) per second	cm/sec
cubic feet per day	cfd
Engineering-News Record	ENR
Environmental Impact Report	EIR
Environmental Impact Statement	EIS
feet per second	fps
gallons per minute	gpm
horsepower	hp
kilowatt(s)	kw
kilowatt hour(s)	kwhr
milliliter	ml
million gallons	mil gal
million gallons per day	mgd
most probable number	MPN
National Pollutant Discharge Elimination System	NPDES
North Shore Outfalls Consolidation	NSOC
Occupational Safety and Health Administration	OSHA
operation and maintenance	O&M
Pacific Gas and Electric Company	PGandE
peak dry weather flow	PDWF
peak wet weather flow	PWWF
pound(s) per cubic foot	pcf
pound(s) per square inch	psi
Regional Water Quality Control Board	RWQCB
rock quality designation	RQD
San Francisco City Datum (feet)	SFCD
San Francisco Macroscopic Model	SFMAC
San Francisco Storm Water Management Model	SFSWMM
Southeast Water Pollution Control Plant	SEWPCP
Southwest Water Pollution Control Plant	SWWPCP
State Water Resources Control Board	SWRCB
Tunnel and Reservoir Plan	TARP
tunnel boring machine	TBM
U.S. Environmental Protection Agency	USEPA
Water Pollution Control Plant	WPCP

APPENDIX C

NPDES PERMIT NO. CA0038610

City and County of San Francisco, North Point and Southeast Sewerage Zones, Wet Weather Diversion Structures

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

ORDER NO. 79-67

NPDES PERMIT NO. CA0038610

WASTE DISCHARGE REQUIREMENTS FOR:

CITY AND COUNTY OF SAN FRANCISCO
NORTH POINT AND SOUTHEAST SEWERAGE ZONES
WET WEATHER DIVERSION STRUCTURES

The California Regional Water Quality Control Board, San Francisco Bay Region, (hereinafter called the Board) finds that:

1. The City and County of San Francisco, hereinafter called the discharger, presently discharges untreated domestic and industrial wastewater mixed with storm water runoff, all containing pollutants, into San Francisco Bay, a water of the United States through any of twenty (20) wet weather diversion structures in the North Point Sewerage zone (Numbers 9 through 28) and fifteen wet weather diversion structures in the Southeast Sewerage zone (Number 29 through 43). These discharges occur only when rainfall exceeds 0.02 inches per hour.

2. These diversion structures are described below:

DISCHARGE Number	DISCHARGE Name	OUTFALL SIZE Width X Height or Diameter	Elevation of Crown re MLLW (b)	PEAK FLOW During 5 yr. Storm (c) -MGD (d)	DISCHARGE LOCATION
9	Baker St.	9'	-8.34	137	190' offshore of Marina Beach
10	Pierce St.	7'	+5.00	331	Muni. Marina
11	Laguna St.	6'	+10.67	330	Muni. Marina
12	Hyde St.	2'	+4.42	abandoned	Aquatic Park
13	Beach St.	7'x6'	+6.67	315	Pier 39
14	Grant St.	3'	+1.75	abandoned	Pier 37
15	Sansome St.	2(a)-(5'6"x6'6")	+7.67	218	Pier 31
16	Greenwich St.	6'	+7.67	65	Pier 23
17	Jackson St.	8'x9'6"	+8.17	263	Pier 3
18	Howard St	7'	+6.75	175	Pier 14
19	Brannan St.	7'6"x6'	+5.67	129	Pier 32
20	Townsend St.	2'x3'	+4.67	17	Pier 38
21	Berry St.	1'3"	+5.92	4	Pier 42
22	Third St.	2'6"x3'9"	+4.42	19	Channel St.
23	Fourth St. No.	6'6"	+7.67	61	Channel St.
24	Fifth St.	9'x7'	+6.67	273	Channel St.
25	Sixth St. No.	6'	+6.17	149	Channel St.
26	Seventh St	4-(9'6"x8'3")	+12.42	1750	Channel St.
27	Sixth St. So.	3'6"x5'3"	+9.42	40	Channel St.
28	Fourth St. So.	2'6"x3'9"	+4.42	13	Channel St.

29	Mariposa St	6'	+8.27'	193	Central Basin
30	Twentieth St.	2'	+2.67'	Negl.	Central Basin
31	No. Third St.	3.5x5.25'	+5.47'	84	Islais Creek
32	Marin St.	10'x8'	+7.67'	710	Islais Creek
33	Selby St.	3[a]-(10'x7.5')	+9.17'	1740	Islais Creek
34	Rankin St.	5'	+9.64'	52	Islais Creek
35	So. Third St.	4.5'	+3.67'	65	Islais Creek
36	Mendell Ave.	4'	abandoned	-	India Basin
37	Evans Ave.	6'	+11.40'	102	India Basin
38	Hudson St.	2.5'	+12.17'	55	India Basin
39	Griffith St. N.	1.75'		16	India Basin
40	Griffith St. S.	5.5'	+7.22'	150	South Basin
41	Yosemite Ave.	9'x7.25'& 11.5'x6.5'	+7.42	590	South Basin
42	Fitch St.	6.75'	+6.38'	102	South Basin
43	Sunnydale Ave.	6.5'	+6.17'	334	Candlestick Cove

(a) Number of barrels
(b) Mean Lower Low Water
(c) These flows result for a short period from a peak rainfall intensity of 1.5 inches per hour
(d) Million Gallons per Day

3. The discharger's long-range plans are to construct facilities to store, transport and treat the combined wastewater from the entire City for discharge to the Ocean in the vicinity of Lake Merced (Southwest Plant). This plan, hereinafter called the Master Plan, was approved in concept by the San Francisco Board of Supervisors on January 27, 1975.

4. The Master Plan would reduce the frequency of discharge of untreated wastewater from a present average of 82 times per year to a range of eight per year to one in five years depending upon the capacity of storage and treatment provided.

5. The Board, on April 8, 1975, adopted a Water Quality Control Plan for the San Francisco Bay Basin. That plan contains a prohibition against the discharge of untreated sewage, water quality objectives for San Francisco Bay and a recommended approach for regulating the discharge from wet weather diversion structures which recommends that exceptions to compliance be allowed provided that beneficial uses are not adversely affected.

6. The combined sewer collection system of San Francisco, designed to transport both sanitary and storm flows, presents a unique problem regarding total compliance with the Basin Plan prohibition against the discharge of untreated waste. The Basin Plan recommends that exceptions to compliance be allowed for wet weather discharges, provided that beneficial uses are not adversely affected; however, a specific exception clause was not included. It is clear that the intent of the Basin Plan is to allow exceptions and this Board will consider inclusion of a specific exception clause during the next Basin Plan updating.

7. The beneficial uses of San Francisco Bay in the vicinity of these diversion structures are:

Navigation
Water contact recreation
Non-water contact recreation
Ocean commercial and sport fishing
Marine Habitat
Fish spawning
Shellfish harvesting (in the vicinity of diversion structures 40, 41, 42, 43 only)
Wildlife habitat
Fish migration

8. The Regional Board adopted Order Nos. 76-22 and 76-24 on March 16, 1976, prescribing waste discharge requirements for these diversion structures.

9. Order No. 76-24 required the discharger to reduce the frequency of discharge for diversion structures No. 9 through 17 to an average of one overflow event per year, and to reduce the frequency of discharge for diversion structures No. 18 through 28 to an average of four overflow events per year. Order No. 76-22 required the discharger to reduce the frequency of discharge for two diversion structures (Numbers 34 and 35) to an average of 4 overflow events per year. Both Orders required the City to undertake a citywide overflow control study to better define the cost and water quality benefits of facilities designed to achieve various overflow frequencies.

10. The discharger did submit an overflow control study for diversion structures No. 9 through 17 (Northshore outfall consolidation) in November, 1978. The Board adopted Order No. 78-102 on November 21, 1978, which amended Order No. 76-24 and contained the following finding:

> "Based upon the presently available planning information contained in these findings and evidence presented at the public meeting concerning the cost differences of facilities necessary to achieve specific overflow frequencies and the water quality benefits derived from construction of those facilities and considering the location and intensity of existing beneficial uses; a long term average of 4 overflows per year for diversion structures No. 9 through 17, will provide adequate overall protection of beneficial uses; provided however that further study to comply with discharge prohibitions No. A.2 and A.3 is required by the discharger where existing discharge points are located in confined areas which do not have adequate exchange with bay water and may not provide adequate protection of adjacent nearshore beneficial uses. Further mitigation may be required in the future, after facilities are placed in operation, if it is determined that beneficial uses are not adequately protected."

This represents the Board's position with respect to diversion structures No. 9 through 17.

11. In a letter dated February 14, 1979, the Environmental Protection Agency objected to Order No. 78-102 and advised that it shall not be effective.

12. The discharger has submitted an overflow control study for diversion structures No. 18 through 43 in May, 1979 and has requested the Regional Board to consider an increase in the number of allowable overflows.

13. The following table provides a comparison of improvement obtainable by reducing the average number of overflows from diversion structures No. 18 through 43 to eight (8), four (4) and one (1) overflows per year compared to the existing average of 46. Data was derived from the discharger's predictive computer model and are therefore approximations.

Average Number of Overflows Per Year (Diversion Structures 18-43)	Existing 46	8	4	1
Minimum/maximum number of overflows per year	17/77	1/20	0/12	0/3
% of annual combined wastewater treated (avg.)	85	98	99	99.7
% of annual combined wastewater which overflows (avg.)	15	2	1	0.3
Volume of overflow (Million gallons/ year, avg.)	4,220	615	292	81
Total hours of overflow per year (avg.)	381	31	14	4
Minimum/maximum hours of overflow per year	157/671	2/76	0/42	0/24
Average duration of overflow (hours)	8.3	3.9	3.5	4
Composition of overflows (avg.)				
% sewage	23	13	13	12
% storm water	77	87	87	88
% reduction in BOD_5 and Suspended Solids discharged from existing overflows (avg.)	Base	85	93	98
Average number of days nearshore water adjacent to discharge points exceed coliform standards for body contact recreation				
days greater than 1000 MPN/100 ml	104	24	13	3
days greater than 10,000 MPN/100 ml	60	11	6	1
Cost of facilities (millions of dollars)				
Capital cost	Base	293	369	465
Annual cost	Base	23.3	29.4	36.4

14. Overflows will occur from storage structures which will be designed to provide for additional removal of settleable and floatable solids. Removal of these solids will provide further mitigation of the aesthetic and public health impacts over and above the mitigation provided by reduction in the frequency of overflows.

15. The overflows from diversion structures No. 36 through 43 discharge to locations proposed to be developed as major water oriented recreation areas and at which significant shellfish resources exist. These areas require a greater degree of protection from the effects of overflows.

16. The difference in capital cost of facilities for diversion structures No. 36 through 43 sized for 8 overflows per year and 1 overflow per year is about $35 million. This additional cost to achieve greater protection in critical areas can be reduced to about $12 million by increasing the allowable overflows from 8 to 10 per year for the remaining bayside structures (No. 18-35). This would increase the total volume of discharges on the bayside by 15-20% above that resulting from a uniform limitation of 8 overflows per year.

17. The discharger completed a final EIR/EIS for the Wastewater Master Plan in May 1974. The discharger completed a final EIR for the Northshore Outfall Consolidation Project in December 1975 which addressed overflows from diversion structures No. 9 through 17. This EIR identified potential adverse water quality impacts from this project related to seismic activity and the project has been modified to mitigate this potential impact. The discharger completed a Final EIR for the Channel Outfalls Consolidation (diversion structures No. 18-28) in May 1976. The EIR did not identify any substantial adverse effects on water resources. An administrative amendment to the EIR was completed in January, 1979 and identifies no additional adverse water quality impacts. The discharger will undertake additional EIR's for facilities to be constructed for diversion structures No. 29 through 43 and this Board will review any adverse water quality impacts identified, and if necessary, make appropriate revisions of this Order. The issuance of waste discharge requirements for this project is exempt from the provisions of Chapter 3 (commencing with Section 21000) of Division 13 of the California Public Resources Code (CEQA) in accordance with Water Code Section 13389.

18. The Board has notified the discharger and interested agencies and persons of its intent to revise waste discharge requirements for these discharges and has provided them with an opportunity for a public hearing and an opportunity to submit their written views and recommendations.

19. The Board, in a public meeting, heard and considered all comments pertaining to the discharge.

20. Based upon presently available planning information contained in these findings and evidence presented at the public meeting concerning the cost differences of facilities necessary to achieve specific overflow frequencies and the water quality benefits derived from construction of those facilities and considering the location and intensity of existing beneficial uses; a long term average of 10 overflows per year for diversion structures No. 18 through 35 and an average of 1 overflow per year for diversion structures No. 36 through 43 will provide adequate overall protection of beneficial uses; provided however that further study to comply with discharge prohibitions No. A.2 and A.3 is required by the discharger where existing discharge points are located in confined areas which do not have adequate exchange with bay water and may not provide adequate protection of adjacent nearshore beneficial uses. Further mitigation may be required in the future, after facilities are placed in operation, if it is determined that beneficial uses are not adequately protected.

21. The Federal Water Pollution Control Act and amendments thereto require that point source discharges comply with appropriate standards by July 1, 1977. The Board will consider an appropriate enforcement order which will include a time schedule for compliance with this Order within 90 days of the date of this Order.

22. This Order shall serve as a National Pollutant Discharge Elimination System permit pursuant to Section 402 of the Federal Water Pollution Control Act, or amendments thereto, and shall take effect at the end of ten days from date of hearing provided the Regional Administrator, U. S. Environmental Protection Agency, has no objections.

IT IS HEREBY ORDERED, that the City and County of San Francisco in order to meet the provisions contained in Division 7 of the California Water Code and regulations adopted thereunder and the provisions of the Federal Water Pollution Control Act and regulations and guidelines adopted thereunder, shall comply with the following:

A. Discharge Prohibitions

1. Discharge of untreated waste to waters of the State is prohibited with the exception of allowable overflows as defined below. The City shall design and construct facilities for diversion structures No. 9-17 to achieve a long term average of 4 overflows per year from these facilities, to design and construct facilities for diversion structures No. 18-35 to achieve a long term average of 10 overflows per year, and to design and construct facilities for diversion structures No. 36 through 43 to achieve a long term average of 1 overflow per year. These long term overflow frequencies shall not be used to determine compliance or noncompliance with the exception. Allowable overflows from these facilities are defined as those discharges which occur when all of the following criteria are met:

a. All storage capacity within a storage facility is fully utilized; and

b. Maximum installed pumping capacity or some lower rate based on limits of downstream transport or treatment capabilities is being utilized to withdraw flows from the storage facility; and,

c. All citywide treatment facilities, excluding the Golden Gate Park reclamation facility, are being operated at capacity or at some lower rate consistent with the maximum withdrawal and transport rates; and,

d. Overflow occurs from a facility employing baffles or other equivalent means to reduce the discharge of floatables.

Overflows which occur when criteria a, b, c, and d are not being met shall be considered violations of this discharge prohibitions.

2. Discharge of waste into dead-end sloughs or similar confined water areas or their tributaries is prohibited.

3. Discharge of waste at any point where it does not receive a minimum initial dilution of at least 10:1 is prohibited.

4. Discharge of dry weather waste from wet weather diversion structures is prohibited.

Exceptions to prohibitions 2 and 3 will be considered where an inordinate financial burden would be placed on the discharger relative to beneficial uses protected and when an equivalent level of environmental protection can be achieved by alternate means.

B. Provisions

1. This discharge shall not cause a violation of any applicable water quality standard for receiving waters adopted by the Regional Board or the State Water Resources Control Board as required by the Federal Water Pollution Control Act and regulations adopted thereunder. If revised applicable water quality standards are promulgated or approved pursuant to Section 303 of the Federal Water Pollution Control Act, or amendments thereto, the Board will revise and modify this Order in accordance with such standards.

2. The discharge of pollutants shall not create a nuisance as defined in the California Water Code.

3. Pursuant to Finding No. 21 the discharger shall comply with the following time schedules to assure compliance with the discharge prohibitions and provisions of this Order:

Task	Completion Date
Full compliance	July 1, 1977

4. The long term average overflow frequency prescribed in this Order is based on information available at the time of adoption of this Order. If the Board finds that changes in the location, intensity or importance of affected beneficial uses or demonstrated unacceptable adverse impacts as a result of operation of the constructed facilities have occurred they may modify the long-term average overflow frequency. Such action could require the modification of constructed facilities. The modification of the operation of constructed facilities or the construction of additional facilities.

5. The City and County of San Francisco shall perform a self-monitoring program in accordance with the specifications prescribed by the Executive Officer of the Regional Board. The City's and County's Health Department is requested to post warning signs on all beaches and shellfish areas, when designated by the Regional Board, affected by the wet weather overflows for a period of time commencing with the day of overflow or at 8:00 a.m. The following day if overflow occurs after 4:00 p.m. and continuing until the water analyses indicate the water quality of the affected areas have recovered and are meeting bacteriological standards for water contact sport recreations in the beach areas <u>or</u> bacteriological standards for shellfish harvesting in shellfish areas, whichever is longer.

6. The City and County of San Francisco is required to submit to the Regional Board by the first day of every month a report, under penalty of perjury, on progress towards compliance with this Order. Said report shall include the status of progress made toward compliance with all tasks of this Order. If noncompliance or threatened noncompliance is reported the reasons for noncompliance and an estimated completion date shall be provided.

7. This Board's Order Nos. 76-22, 76-24 and 78-102 are hereby rescinded (NPDES Nos. CA 0038423 and CA0038407).

8. This Order includes items 1, 4, and 5 of the attached "Reporting Requirements," dated August 8, 1973.

9. This Order includes all items of the attached "Standard Provisions", dated August 8, 1973.

10. This Order expires on June 1, 1984, and the discharger must file a Report of Waste Discharge in accordance with Title 23, California Administrative Code, not later than 180 days in advance of such date as application for issuance of new waste discharge requirements.

11. In the event of any change in control or ownership of land or waste discharge facilities presently owned or controlled by the discharger, the discharger shall notify the succeeding owner or operator of the existence of this Order by a letter, a copy of which shall be forwarded to this Board.

I, Fred H. Dierker, Executive Officer, do hereby certify the foregoing is a full, true, and correct copy of an order adopted by the California Regional Water Quality Control Board, San Francisco Bay Region, on June 19, 1979.

FRED H. DIERKER
Executive Officer

Attachments:
Reporting Requirements 8/8/73
Standard Provisions 8/8/73

APPENDIX D

COST-EFFECTIVENESS ANALYSIS GUIDELINES

(Appendix A to 40 CFR 35)

APPENDIX A

COST-EFFECTIVENESS ANALYSIS GUIDELINES

1. *Purpose.* These guidelines represent Agency policies and procedures for determining the most cost-effective waste treatment management system or component part.

2. *Authority.* These guidelines are provided under sections 212(2)(C) and 217 of the Clean Water Act.

3. *Applicability.* These guidelines, except as otherwise noted, apply to all facilities planning under step 1 grant assistance awarded after September 30, 1978. The guidelines also apply to State or locally financed facilities planning on which subsequent step 2 or step 3 Federal grant assistance is based.

4. *Definitions.* Terms used in these guidelines are defined as follows:

a. *Waste treatment management system.* Used synonymously with "complete waste treatment system" as defined in § 35.905 of this subpart.

b. *Cost-effectiveness analysis.* An analysis performed to determine which waste treatment management system or component part will result in the minimum total resources costs over time to meet Federal, State, or local requirements.

c. *Planning period.* The period over which a waste treatment management system is evaluated for cost-effectiveness. The planning period begins with the system's initial operation.

d. *Useful life.* The estimated period of time during which a treatment works or a component of a waste treatment management system will be operated.

e. *Disaggregation.* The process or result of breaking down a sum total of population or economic activity for a State or other jurisdiction (i.e., designated 208 area or SMSA) into smaller areas or jurisdictions.

5. *Identification, selection, and screening of alternatives.* a. *Identification of alternatives.* All feasible alternative waste management systems shall be initially identified. These alternatives should include systems discharging to receiving waters, land application systems, on-site and other non-centralized systems, including revenue generating applications, and systems employing the reuse of wastewater and recycyling of pollutants. In identifying alternatives, the applicant shall consider the possibility of no action and staged development of the system.

b. *Screening of alternatives.* The identified alternatives shall be systematically screened to determine those capable of meeting the applicable Federal, State and local criteria.

c. *Selection of alternatives.* The identified alternatives shall be initially analyzed to determine which systems have cost-effective potential and which should be fully evaluated according to the cost-effectiveness analysis procedures established in the guidelines.

d. *Extent of effort.* The extent of effort and the level of sophistication used in the cost-effectiveness analysis should reflect the project's size and importance. Where processes or techniques are claimed to be innovative technology on the basis of the cost reduction criterion contained in paragraph 6e(1) of Appendix E to this subpart, a sufficiently detailed cost analysis shall be included to substantiate the claim to the satisfaction of the Regional Administrator.

6. *Cost-effectiveness analysis procedures.*

a. *Method of analysis.* The resources costs shall be determined by evaluating opportunity costs. For resources that can be expressed in monetary terms, the analysis will use the interest (discount) rate established in paragraph 6e. Monetary costs shall be calculated in terms of present worth values or equivalent annual values over the planning period defined in section 6b. The analysis shall descriptively present nonmonetary factors (e.g., social and environmental) in order to determine their significance and impact. Nonmonetary factors include primary and secondary environmental effects, implementation capability, operability, performance reliability and flexibility. Although such factors as use and recovery of energy and scarce resources and recycling of nutrients are to be included in the monetary cost analysis, the non-monetary evaluation shall also include them. The most cost-effective alternative shall be the waste treatment management system which the analysis determines to have the lowest present worth or equivalent annual value unless nonmonetary costs are overriding. The most cost-effective alternative must also meet the minimum requirements of applicable effluent limitations, groundwater protection, or other applicable standards established under the Act.

b. *Planning period.* The planning period for the cost-effectiveness analysis shall be 20 years.

c. *Elements of monetary costs.* The monetary costs to be considered shall include the total value of the resources which are attributable to the waste treatment management system or to one of its component parts. To determine these values, all monies necessary for capital construction costs and operation and maintenance costs shall be identified.

(1) Capital construction costs used in a cost-effective analysis shall include all contractors' costs of construction including overhead and profit, costs of land, relocation, and right-of-way and easement acquisition; costs of design engineering, field exploration and engineering services during construction; costs of administrative and legal services including costs of bond sales; startup costs such as operator training; and interest during construction. Capital construction costs shall also include contingency allowances consistent with the cost estimate's level of precision and detail.

(2) The cost-effectiveness analysis shall include annual costs for operation and maintanance (including routine replacement of equipment and equipment parts). These costs shall be adequate to ensure effective and dependable operation during the system's planning period. Annual costs shall be divided between fixed annual costs and costs which would depend on the annual quantity of waste water collected and treated. Annual revenues generated by the waste treatment management system through energy recovery, crop production, or other outputs shall be deducted from the annual costs for operation and maintenance in accordance with guidance issued by the Administrator.

d. *Prices.* The applicant shall calculate the various components of costs on the basis of market prices prevailing at the time of the cost-effectiveness analysis. The analysis shall not allow for inflation of wages and prices, except those for land, as described in paragraph 6h(1) and for natural gas. This stipulation is based on the implied assumption that prices, other than the exceptions, for resources involved in treatment works construction and operation, will tend to change over time by approximately the same percentage. Changes in the general level of prices will not affect the results of the cost-effectiveness analysis. Natural gas prices shall be escalated at a compound rate of 4 percent annually over the planning period, unless the Regional Administrator determines that the grantee has justified use of a greater or lesser percentage based upon regional differentials between historical natural gas price escalation and construction cost escalation. Land prices shall be appreciated as provided in paragraph 6h(1). Both historical data and future projections support the gas and land price escalations relative to those for other goods and services related to waste water treatment. Price escalation rates may be updated periodically in accordance with Agency guidelines.

e. *Interest (discount) rate.* The rate which the Water Resources Council establishes annually for evaluation of water resource projects shall be used.

f. *Interest during construction.* (1) Where capital expenditures can be expected to be fairly uniform during the construction period, interest during construction may be calculated at I=1/2PCi where:

I=the interest accrued during the construction period.
P=the construction period in years,
C=the total capital expenditures,
i=the interest rate (discount rate in section 6e).

(2) Where expenditures will not be uniform, or when the construction period will be greater than 4 years, interest during construction shall be calculated on a year-by-year basis.

g. *Useful life.* (1) The treatment works' useful life for a cost-effectiveness analysis shall be as follows:

Land—permanent.
Waste water conveyance structures (includes collection systems, outfall pipes, interceptors, force mains, tunnels, etc.)—50 years.
Other structures (includes plant building, concrete process tankage, basins, lift stations structures, etc.)—30-50 years.
Process equipment—15-20 years.
Auxiliary equipment—10-15 years.

(2) Other useful life periods will be acceptable when sufficient justification can be provided. Where a system or a component is for interim service, the anticipated useful life shall be reduced to the period for interim service.

h. *Salvage value.* (1) Land purchased for treatment works, including land used as part of the treatment process or for ultimate disposal of residues, may be assumed to have a salvage value at the end of the planning period at least equal to its prevailing market value at the time of the analysis. In calculating the salvage value of land, the land value shall be appreciated at a compound rate of 3 percent annually over the planning period, unless the Regional Administrator determines that the grantee has justified the use of a greater or lesser percentage based upon historical differences between local land cost escalation and construction cost escalation. The land cost escalation rate may be updated periodically in accordance with Agency guidelines. Right-of-way easements shall be considered to have a salvage value not greater than the prevailing market value at the time of the analysis.

(2) Structures will be assumed to have a salvage value if there is a use for them at the end of the planning period. In this case, salvage value shall be estimated using straight line depreciation during the useful life of the treatment works.

(3) The method used in paragraph 6h(2) may be used to estimate salvage value at the end of the planning period for phased additions of process equipment and auxiliary equipment.

(4) When the anticipated useful life of a facility is less than 20 years (for analysis of interim facilities), salvage value can be claimed for equipment if it can be clearly demonstrated that a specific market or reuse opportunity will exist.

7. *Innovative and alternative wastewater treatment processes and techniques.*

a. Beginning October 1, 1978, the capital costs of publicly owned treatment works which use processes and techniques meeting the criteria of Appendix E to this subpart and which have only a water pollution control function, may be eligible if the present worth cost of the treatment works is not more than 115 percent of the present worth cost of the most cost-effective pollution control system, exclusive of collection sewers and interceptors common to the two systems being compared, by 115 percent, except for the following situation.

b. Where innovative or alternative unit processes would serve in lieu of conventional unit processes in a conventional waste water treatment plant, and the present worth costs of the nonconventional unit processes are less than 50 percent of the present worth costs of the treatment plant, multiply the present worth costs of the replaced conventional processes by 115 percent, and add the cost of nonreplaced unit processes.

c. The eligibility of multipurpose projects which combine a water pollution control function with another function, and which use processes and techniques meeting the criteria of Appendix E to this subpart, shall be determined in accordance with guidance issued by the Administrator.

d. The above provisions exclude individual systems under § 35.918. The regional Administrator may allow a grantee to apply the 15-percent preference authorized by this section to facility plans prepared under step 1 grant assistance awarded before October 1, 1978.

8. *Cost-effective staging and sizing of treatment works.*

a. *Population projections.* (1) The disaggregation of State projections of population shall be the basis for the population forecasts presented in individual facility plans, except as noted. These State projections shall be those developed in 1977 by the Bureau of Economic Analysis (BEA), Department of Commerce, unless, as of June 26, 1978, the State has already prepared projections. These State projections may be used instead of the BEA projections if the year 2000 State population does not exceed that of the BEA projection by more than 5 percent. If the difference exceeds this amount, the State must either justify or lower its projection. Justification must be based on the historical and current trends (e.g., energy and industrial development, military base openings) not taken into account in the BEA projections. The State must submit for approval to the Administrator the request and justification for use of State projections higher than the BEA projections. By that time, the State shall issue a public notice of the request. Before the Administrator's approval of the State projection, the Regional Administrator shall solicit public comments and hold a public hearing if important issues are raised about the State projection's validity. State projections and disaggregations may be updated periodically in accordance with Agency guidelines.

(2) Each State, working with designated 208 planning agencies, organizations certified by the Governor under section 174(a) of the Clean Air Act, as amended, and other regional planning agencies in the State's nondesignated areas, shall disaggregate the State population projection among its designated 208 areas, other standard metropolitan statistical areas (SMSA's) not included in the 208 area, and non-SMSA counties or other appropriate jurisdictions. States that had enacted laws, as of June 26, 1978, mandating disaggregation of State population totals to each county for areawide 208 planning may retain this requirement. When disaggregating the State population total, the State shall take into account the projected population and economic activities identified in facility plans, areawide 208 plans and municipal master plans. The sum of the disaggregated projections shall not exceed the State projection. Where a designated 208 area has, as of June 26, 1978, already prepared a population projection, it may be used if the year 2000 population does not exceed that of the disaggregated projection by more than 10 percent. The State may then increase its population projection to include all such variances rather than lower the population projection totals for the other areas. If the 208 area population forecast exceeds the 10 percent allowance, the 208 agency must lower its projection within the allowance and submit the revised projection for approval to the State and the Regional Administrator.

(3) The State projection totals and the disaggregations will be submitted as an output of the statewide water quality management process. The submission shall include a list of designated 208 areas, all SMSA's, and counties or other units outside the 208 areas. For each unit the disaggregated population shall be shown for the years 1980, 1990, and 2000. Each State will submit its projection totals and disaggregations for the Regional Administrator's approval before October 1, 1979. Before this submission, the State shall hold a public meeting on the disaggregations and shall provide public notice of the meeting consistent with Part 25 of this chapter. (See § 35.917(e).)

(4) When the State projection totals and disaggregations are approved they shall be used thereafter for areawide water quality management planning as well as for facility planning and the needs surveys under section 516(b) of the Act. Within areawide 208 planning areas, the designated agencies, in consultation with the States, shall disaggregate the 208 area projections among the SMSA and non-SMSA areas and then disaggregate these SMSA and non-SMSA projections among the facility planning areas and the remaining areas. For those SMSA's not included within designated 208 planning areas, each State, with assistance from appropriate regional planning agencies, shall disaggregate the SMSA projection among the facility planning areas and the remaining areas within the SMSA. The State shall check the facility planning area forecasts to ensure reasonableness and consistency with the SMSA projections.

(5) For non-SMSA facility planning areas not included in designated areawide 208 areas, the State may disaggregate population projections for non-SMSA counties among facility planning areas and remaining areas. Otherwise, the grantee is to forecast future population growth for the facility planning area by linear extrapolation of the recent past (1960 to present) population trends for the planning area, use of correlations of planning area growth with population growth for the township, county or other larger parent area population, or another appropriate method. A population forecast may be raised above that indicated by the extension of past trends where likely impacts (e.g., significant new energy developments, large new industries, Federal installations, or institutions) justify the difference. The facilities plan must document the justification. These population forecasts should be based on estimates of new employment to be generated. The State shall check individual population forecasts to insure consistency with overall projections

for non-SMSA counties and justification for any difference from past trends.

(6) Facilities plans prepared under step 1 grant assistance awarded later than 6 months after Agency approval of the State disaggregations shall follow population forecasts developed in accordance with these guidelines.

b. *Wastewater flow estimates.* (1) In determining total average daily flow for the design of treatment works, the flows to be considered include the average daily base flows (ADBF) expected from residential sources, commercial sources, institutional sources, and industries the works will serve plus allowances for future industries and nonexcessive infiltration/inflow. The amount of nonexcessive infiltration/inflow not included in the base flow estimates presented herein, is to be determined according to the Agency guidance for sewer system evaluation or Agency policy on treatment and control of combined sewer overflows (PRM 75-34).

(2) The estimation of existing and future ADBF, exclusive of flow reduction from combined residential, commercial and institutional sources, shall be based upon one of the following methods:

(a) *Preferred method.* Existing ADBF is estimated based upon a fully documented analysis of water use records adjusted for consumption and losses or on records of wastewater flows for extended dry periods less estimated dry weather infiltration. Future flows for the treatment works design should be estimated by determining the existing per capita flows based on existing sewered resident population and multiplying this figure by the future projected population to be served. Seasonal population can be converted to equivalent full time residents using the following multipliers:

Day-use visitor	0.1 to 0.2
Seasonal visitor	0.5 to 0.8

The preferred method shall be used wherever water supply records or wastewater flow data exist. Allowances for future increases of per capita flow over time will not be approved.

(b) *Optional method.* Where water supply and wastewater flow data are lacking, existing and future ADBF shall be estimated by multiplying a gallon per capita per day (gpcd) allowance not exceeding those in the following table, except as noted below, by the estimated total of the existing and future resident populations to be served. The tabulated ADBF allowances, based upon several studies of municipal water use, include estimates for commercial and institutional sources as well as residential sources. The Regional Administrator may approve exceptions to the tabulated allowances where large (more than 25 percent of total estimated ADBF) commercial and institutional flows are documented.

Description	Gallons per capita per day
Non-SMSA cities and towns with projected total 10-year populations of 5,000 or less	60 to 70
Other cities and towns	65 to 80

c. *Flow reduction.* The cost-effectiveness analysis for each facility planning area shall include an evaluation of the costs, cost savings, and effects of flow reduction measures unless the existing ADBF from the area is less than 70 gpcd, or the current population of the applicant municipality is under 10,000, or the Regional Administrator exempts the area for having an effective existing flow reduction program. Flow reduction measures include public education, pricing and regulatory approaches or a combination of these. In preparing the facilities plan and included cost effectiveness analysis, the grantee shall, as a minimum:

(1) Estimate the flow reductions implementable and cost effective when the treatment works become operational and after 10 and 20 years of operation. The measures to be evaluated shall include a public information program; pricing and regulatory approaches; installation of water meters, and retrofit of toilet dams and low-flow showerheads for existing homes and other habitations; and specific changes in local ordinances, building codes or plumbing codes requiring installations of water saving devices such as water meters, water conserving toilets, showerheads, lavatory faucets, and appliances in new homes, motels, hotels, institutions, and other establishments.

(2) Estimate the costs of the proposed flow reduction measures over the 20-year planning period, including costs of public information, administration, retrofit of existing buildings and the incremental costs, if any, of installing water conserving devices in new homes and establishments.

(3) Estimate the energy reductions; total cost savings for wastewater treatment, water supply and energy use; and the net cost savings (total savings minus total costs) attributable to the proposed flow reduction measures over the planning period. The estimated cost savings shall reflect reduced sizes of proposed wastewater treatment works plus reduced costs of future water supply facility expansions.

(4) Develop and provide for implementing a recommended flow reduction program. This shall include a public information program highlighting effective flow reduction measures, their costs, and the savings of water and costs for a typical household and for the community. In addition, the recommended program shall comprise those flow

reduction measures which are cost effective, supported by the public and within the implementation authority of the grantee or another entity willing to cooperate with the grantee.

(5) Take into account in the design of the treatment works the flow reduction estimated for the recommended program.

d. *Industrial flows.* (1) The treatment works' total design flow capacity may include allowances for industrial flows. The allowances may include capacity needed for industrial flows which the existing treatment works presently serves. However, these flows shall be carefully reviewed and means of reducing them shall be considered. Letters of intent to the grantee are required to document capacity needs for existing flows from significant industrial users and for future flows from all industries intending to increase their flows or relocate in the area. Requirements for letters of intent from significant industrial dischargers are set forth in § 35.925-11(c).

(2) While many uncertainties accompany forecasting future industrial flows, there is still a need to allow for some unplanned future industrial growth. Thus, the cost-effective (grant eligible) design capacity and flow of the treatment works may include (in addition to the existing industrial flows and future industrial flows documented by letters of intent) a nominal flow allowance for future nonidentifiable industries or for unplanned industrial expansions, provided that 208 plans, land use plans and zoning provide for such industrial growth. This additional allowance for future unplanned industrial flow shall not exceed 5 percent (or 10 percent for towns with less than 10,000 population) of the total design flow of the treatment works exclusive of the allowance or 25 percent of the total industrial flow (existing plus documented future), whichever is greater.

e. *Staging of treatment plants.* (1) The capacity of treatment plants (i.e., new plants, upgraded plants, or expanded plants) to be funded under the construction grants program shall not exceed that necessary for wastewater flows projected during an initial staging period determined by one of the following methods:

(a) *First method.* The grantee shall analyze at least three alternative staging periods (10 years, 15 years, and 20 years). He shall select the least costly (i.e., total present worth or average annual cost) staging period.

(b) *Second method.* The staging period shall not exceed the period which is appropriate according to the following table.

STAGING PERIODS FOR TREATMENT PLANTS

Flow growth factors (20 years) [1]	Staging period [2] (years)
Less than 1.3	20
1.3 to 1.8	15
Greater than 1.8	10

[1] Ratio of wastewater flow expected at end of 20 year planning period to initial flow at the time the plant is expected to become operational.

[2] Maximum initial staging period.

(2) A municipality may stage the construction of a treatment plant for a shorter period than the maximum allowed under this policy. A shorter staging period might be based upon environmental factors (secondary impacts, compliance with other environmental laws under § 35.925-14, energy conservation, water supply), an objective concerning planned modular construction, the utilization of temporary treatment plants, or attainment of consistency with locally adopted plans including comprehensive and capital improvement plans. However, the staging period in no case may be less than 10 years, because of associated cost penalties and the time necessary to plan, apply for and receive funding, and construct later stages.

(3) The facilities plan shall present the design parameters for the proposed treatment plant. Whenever the proposed treatment plant components' size or capacity would exceed the minimum reliability requirements suggested in the EPA technical bulletin, "Design Criteria for Mechanical, Electric, and Fluid System and Component Reliability," a complete justification, including supporting data, shall be provided to the Regional Administrator for his approval.

f. *Staging of interceptors.* Since the location and length of interceptors will influence growth, interceptor routes and staging of construction shall be planned carefully. They shall be consistent with approved 208 plans, growth management plans and other environmental laws under § 35.925-14 and shall also be consistent with Executive orders for flood plains and wetlands.

(1) Interceptors may be allowable for construction grant funding if they eliminate existing point source discharges and accommodate flows from existing habitations that violate an enforceable requirement of the Act. Unless necessary to meet those objectives, interceptors should not be extended into environmentally sensitive areas, prime agricultural lands and other undeveloped areas (density less than one household per 2 acres). Where extension of an interceptor through such areas would be necessary to interconnect two or more communities, the grantee shall reassess the need for the interceptor by further consideration of alterna-

tive wastewater treatment systems. If the reassessment demonstrates a need for the interceptor, the grantee shall evaluate the interceptor's primary and secondary environmental impacts, and provide for appropriate mitigating measures such as rerouting the pipe to minimize adverse impacts or restricting future connections to the pipe. Appropriate and effective grant conditions (e.g., restricting sewer hookups) should be used where necessary to protect environmentally sensitive areas or prime agricultural lands from new development. NPDES permits shall include the conditions to insure implementation of the mitigating measures when new permits are issued to the affected treatment facilities in those cases where the measures are required to protect the treatment facilities against overloading.

(2) Interceptor pipe sizes (diameters for cylindrical pipes) allowable for construction grant funding shall be based on a staging period of 20 years. A larger pipe size corresponding to a longer staging period not to exceed 40 years may be allowed if the grantee can demonstrate, wherever water quality management plans or other plans developed for compliance with laws under § 35.925-14 have been approved, that the larger pipe would be consistent with projected land use patterns in such plans and that the larger pipe would reduce overall (primary plus secondary) environmental impacts. These environmental impacts include:

(a) *Primary impacts.* (i) Short-term disruption of traffic, business and other daily activities.

(ii) Destruction of flora and fauna, noise, erosion, and sedimentation.

(b) *Secondary impacts.* (i) Pressure to rezone or otherwise facilitate unplanned development.

(ii) Pressure to accelerate growth for quicker recovery of the non-Federal share of the interceptor investments.

(iii) Effects on air quality and environmentally sensitive areas by cultural changes.

(3) The estimation of peak flows in interceptors shall be based upon the following considerations:

(a) Daily and seasonal variations of pipe flows, the timing of flows from the various parts of the tributary area, and pipe storage effects.

(b) The feasibility of off-pipe storage to reduce peak flows.

(c) The use of an appropriate peak flow factor that decreases as the average daily flow to be conveyed increases.

9. *State guidelines.* If a State has developed or chooses to develop comprehensive guidelines on cost-effective sizing and staging of treatment works, the Regional Administrator may approve all or portions of the State guidance for application to step 1 facility plans. Approved State guidance may be used instead of corresponding portions of these guidelines, if the following conditions are met:

a. The State guidance must be at least as stringent as the provisions of these guidelines.

b. The State must have held at least one public hearing on proposed State guidance, under regulations in Part 25 of this chapter, before submitting the guidance for Agency approval.

10. *Additional capacity beyond the cost-effective capacity.* Treatment works which propose to include additional capacity beyond the cost-effective capacity determined in accordance with these guidelines may receive Federal grant assistance if the following requirements are met:

a. The facilities plan shall determine the most cost-effective treatment works and its associated capacity in accordance with these guidelines. The facilities plan shall also determine the actual characteristics and total capacity of the treatment works to be built.

b. Only a portion of the cost of the entire proposed treatment works including the additional capacity shall be eligible for Federal funding. The portion of the cost of construction which shall be eligible for Federal funding under sections 203(a) and 202(a) of the Act shall be equivalent to the estimated construction costs of the most cost-effective treatment works. For the eligibility determination, the costs of construction of the actual treatment works and the most cost-effective treatment works must be estimated on a consistent basis. Up-to-date cost curves published by EPA's Office of Water Program Operations or other cost estimating guidance shall be used to determine the cost ratios between cost-effective project components and those of the actual project. These cost ratios shall be multiplied by the step 2 cost and step 3 contract costs of actual components to determine the eligible step 2 and step 3 costs.

c. The actual treatment works to be built shall be assessed. It must be determined that the actual treatment works meets the requirements of the National Environmental Policy Act and all applicable laws, regulations, and guidance, as required of all treatment works by §§ 35.925-8 and 35.925-14. Particular attention should be given to assessing the project's potential secondary environmental effects and to ensuring that air quality standards will not be violated. The actual treatment works' discharge must not cause violations of water quality standards.

d. The Regional Administrator shall approve the plans, specifications, and estimates for the actual treatment works under section 203(a) of the Act, even though EPA will be funding only a portion of its designed capacity.

e. The grantee shall satisfactorily assure the Agency that the funds for the construction costs due to the addtional capacity beyond the cost-effective treatment works' capacity as determined by EPA (i.e., the ineligible portion of the treatment works), as well as the local share of the grant eligible portion of the construction costs will be available.

f. The grantee shall execute appropriate grant conditions or releases providing that the Federal Government is protected from any further claim by the grantee, the State, or any other party for any of the costs of construction due to the additional capacity.

g. Industrial cost recovery shall be based upon the portion of the Federal grant allocable to the treatment of industrial wastes.

h. The grantee must implement a user charge system which applies to the entire service area of the grantee, including any area served by the additional capacity.

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APPENDIX E

EXAMPLE OF ANALYSIS OF TOTAL PRESENT WORTH COST

May 30, 1980

EXAMPLE WITHOUT INFLATION

CROSSTOWN PUMP STATION

Important Dates

Cost-effectiveness analysis	January 1, 1980
Complete land acquisition	May 1, 1982
Start construction	May 1, 1982
Complete construction and start of planning period	May 1, 1985
End of planning period	May 1, 2005

Capital Cost

Construction at ENR = 3800 (including contractor's bonds, insurance, overhead and profit)

Structures	$20,000,000	
Mechanical	18,000,000	$38,000,000
Contingency (15%)		5,700,000
Professional services (16%)		6,100,000
Subtotal		$49,800,000
Interest 1/2 x 3 yrs x $49,800,000 x 0.07125 =		5,300,000
Subtotal		$55,100,000
Land		2,000,000
Total Capital Cost		$57,100,000
Less Salvage Value		
Structures $\frac{50-20}{50}$ x 55,100,000 x $\frac{20}{38}$ x 0.1789 =		-3,100,000
Land $2,000,000 x $(1.03)^{25}$ x 0.1789 =		- 700,000
Capital Cost Less Salvage Value		$53,300,000

O&M Cost

Labor	$200,000/yr.	
Materials and supplies	20,000/yr.	
Energy (electrical)	500,000/yr.	
Total O&M Cost	$720,000/yr.	
PW of O&M	$720,000 x 10.4919 x 0.7088 =	$ 5,400,000
TOTAL PRESENT WORTH COST		$58,700,000
EQUIVALENT ANNUAL COST	$58,700,000 x 0.0953 =	$ 5,600,000